THE REFINER AND NATURAL GASOLINE MANUFACTURER

In This Issue

More about Cracking Processes—This issue has comprehensive articles on the Fleming, Cross, Stevens and Hovey Methods.

Refiners all set for April 10-11-12. Galveston prepared for annual meet of Western Petroleum Refiners.

What's coming? Interviews from Natural Gasoline Plant Executives and Refiners give slant on what is expected in coming season.

Tentative program of Natural Gasoline Men's annual Spring Meet at Tulsa.

Vol. 2 No. 3 MARCH, 1923 $1.00 Per Year

NIGHT

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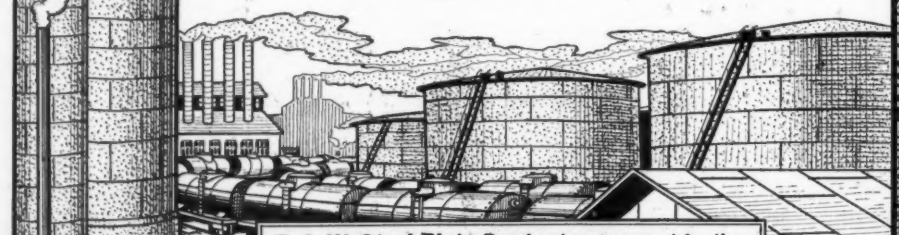

P. I. W. Steel Plate Products are used in the Petroleum, Gas, Chemical, Mining, Railway, Iron and Steel, Water Works, Engineering and Allied Industries

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Renewed activities in various basic industries demanding heavy supplies of oil or its products, particularly the automobile industry, would indicate to any thoughtful observer that 1923 will be a banner year in oil production and distribution. And from information obtained from the best sources there is no doubt that this will be the peak year in the history of the oil business.

Oil companies report their production sold far in advance. While car companies have also booked their production for months to come.

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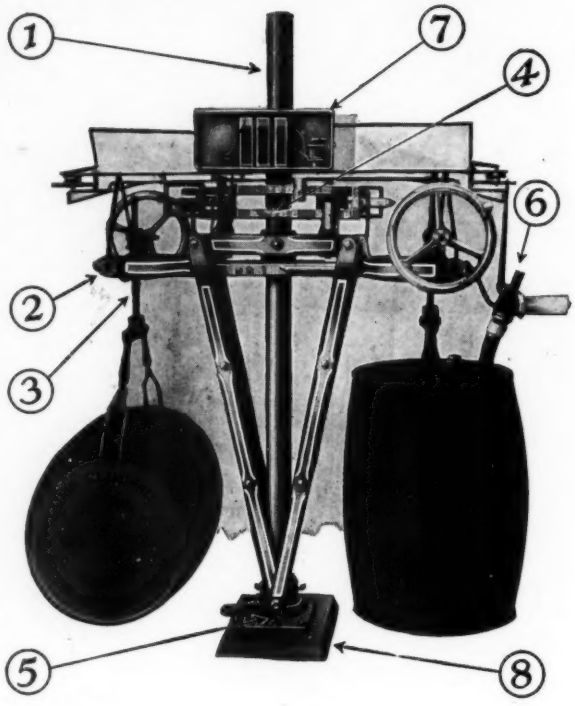

The Sawyer Automatic Fluid Scale

1 The Sawyer Automatic Fluid Scale measures the contents of barrels while they are being filled with liquids by automatically cutting off the flow when the contents of the barrel reaches the desired weight.

2 It consists of two opposite and identical arms. Each arm is in itself a complete and accurate scale unit. One arm is always in position for changing a barrel, while the other arm holds a barrel in position to be filled.

3 In operation, a barrel is placed under the hooks which grip the chimes of the barrel or drum. Then a few turns of the wheel raises the barrel from the floor. Two sizes of hooks are supplied to hold barrels or drums in which the bung is in either the side or the end. The hooks are instantly interchangeable without the use of tools.

4 Each side of the scale is equipped with a double-bladed beam. The operator sets a poise weight on the upper blade to balance the exact tare weight. The poise weight on the lower blade is set at the exact net weight of the liquid desired in the barrel—whether you desire the container partly filled or filled to capacity. The double bladed beam shows at a glance, (1) tare weight, (2) net weight, (3) gross weight.

5 The scale is revolved on a ball-bearing base, bringing the empty barrel under the filling spout. This base has a locating catch which stops the scale so that the bung of the barrel is under the filling spout in exact position for filling.

6 The flow into the container is started by the opening of the valve. This valve is held open by handle latched into an automatic trip.

7 While the barrel is filling, the operator can work elsewhere. When the contents of the barrel has reached the predetermined quantity, the beam actuates, making an electrical contact which closes the circuit, releasing the valve handle and shutting off the flow of liquid. The action of this mechanism is instantaneous and positive. It is a self contained unit operating from standard dry cells. There is no electrical connection required. The supply stops when the predetermined amount has entered the barrel. Spillage is entirely avoided. When the supply has been automatically shut off, the scale is revolved, bringing the empty barrel into filling position and carrying the filled barrel around to where it can be changed for an empty.

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R. L. DUDLEY..Manager and Editor

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On Cracking Processes

PUBLICATION in the January and February issues of The Refiner and Natural Gasoline Manufacturer of articles relating to certain cracking processes has developed that this publication has "hit the nail on the head" in giving our refiner readers what they want.

It must be explained, lest misunderstanding arise, that The Refiner and Natural Gasoline Manufacturer is simply presenting to its readers articles written by people who are in a position to write on the various processes, and that this publication is simply acting as a medium to bring out the data on the various systems, and is not favoring one above the other.

Quite naturally, a man who has been using one process, or who has developed a process, is sure that his is the best process offered. That no doubt accounts for the fact that some of the articles have been slightly contradictory in stating that the particular process described is the best in the world.

That the refiner who pays no attention to the development of cracking processes is asleep at the switch goes without saying. This publication desires to offer its readers everything available on the various processes, and if there is a commercial process that has not been described to date, we shall be glad to have our readers ask us about it, and in turn we shall endeavor to get an article on it.

Future issues have scheduled a number of additional articles on cracking processes, as well as other articles of interest to refiners.

What Does It Cost—

A PROPERLY conducted business knows its costs every day or week. This is necessary even when the price of raw material is fairly steady, but in an industry like the refining industry, it is absolutely necessary that an accurate cost system be used.

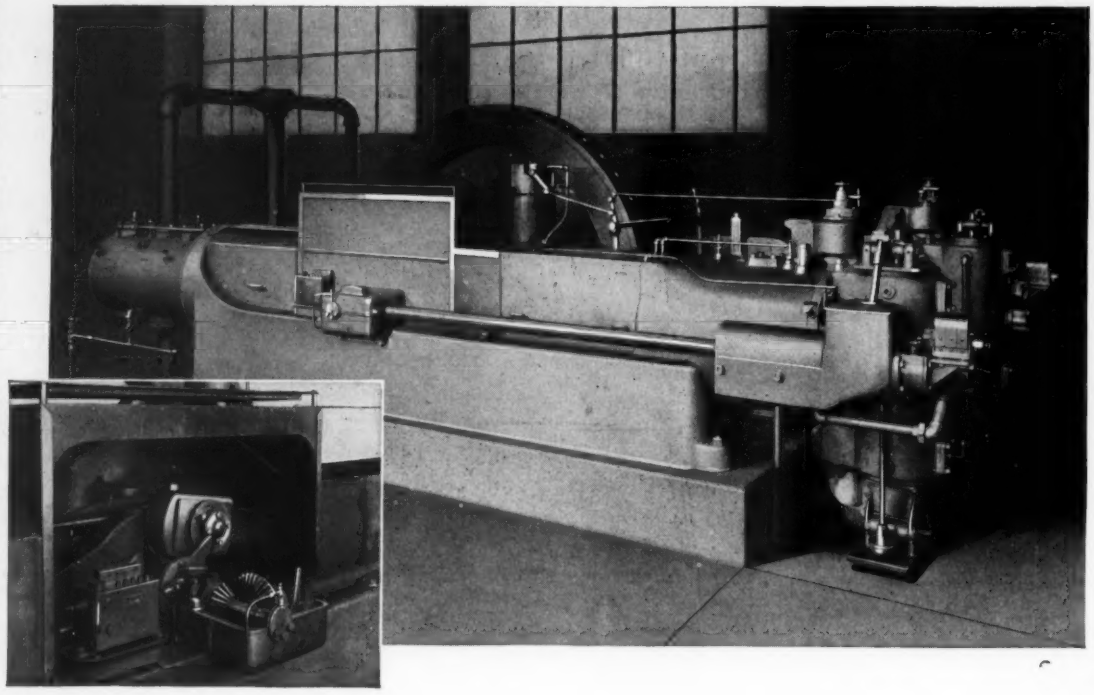
In the printing business, which takes raw material —paper—and salesmanship and turns out printed matter, a universal cost system has been developed that enables the plant owner to compute within a few cents his profit on any job.

In the refining business, where the totals run up into big money, it is even more necessary. Of course a cost system would not cause a plant to make money, but if a universal cost system were in use, or a system that were anything like universal, it might prevent a lot of the "selling below cost" that means loss of profit and loss of money.

Such a system should take into consideration everything from the time the crude is bought until the bills on refined products are collected and the money banked. Many refineries have such a system. It enables them to bolster up their weak departments and save expense where expense logically should be reduced.

It is our hope to present to readers of The Refiner and Natural Gasoline Manufacturer some of the cost systems in use both by natural gasoline plants and by refineries, in an early issue.

The frontispiece on this month's Refiner and Natural Gasoline Manufacturer is by Margaret Brisbine, whose work at the Philadelphia Art Institute has been attracting considerable attention during the past twelve months. Miss Brisbine was allowed to make a night sketch for the Gulf Publishing Company through the courtesy of a large refining company and our thanks are due her and the refinery management for the drawing reproduced on our front cover. —Editor



Notice the Cooper Lay Shaft Drive

Simple, easy to get at and nothing to give trouble is your very first impression. The bearings are all removable babbitted half shells automatically lubricated and right out where you can adjust them without twisting your neck or kinking your back. The gears dip in oil and run so silently that one operator writes, "You have to make a special effort to hear them."

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Since 1833 Engineers and Builders

The Galvez Hotel at Galveston where all sessions of the Western Petroleum Refiners Association's meeting will be held

Galveston Is Ready to Entertain Refiners

Island City has stage all set for April 10, 11, 12. Large attendance anticipated for meet

Galveston is getting set to entertain the Western Petroleum Refiners Association when its annual convention is held in the Island City April 10-11-12. The city, one of the most historic on the Gulf Coast, is a pastmaster at entertaining in mid-summer, and Galvestonians are going to out-do themselves by showing the refiners how a semi-tropical city looks and acts in mid-spring.

"Will it be too cold for bathing when the convention meets?" we asked the secretary of the Galveston Chamber of Commerce last week.

"Well, that depends," he answered. "People down here go into the surf every day in the year, but I'll admit that those people are mighty few. Still, if those refiners feel frisky, the surf is there and no doubt some of them will want to try it."

So it is possible that bathing will not be an important part on the program. There will be ships—all kinds of ships, one refiner has asserted, and the oleanders will be getting ready to bloom, and—well, just to show what tales the beach can tell, we're re-producing on this page one of the winners at the annual bathing review at Galveston not so long ago.

The Galvez is amply able to take care of the crowd. Reservations have been coming in in good style for several weeks. Texas City, across the bay from Galveston, which is becoming quite an oil town because of its refineries, loading and unloading facilities, is inviting the refiners to "come over" and if the refiners do not have a good time, it will be their own fault.

Houston also is only 50 miles away and on the route that must be taken to and from Galveston. Excursions can be arranged for boat trips up the Houston Ship Channel, passing the Goose Creek oil field and the numerous refining plants located along the channel, receiving crude in tankers from Mexico and shipping refined oils direct by water from the greatest inland port of America.

The visitor need not worry about the weather. April here is really spring. The inland visitor no less than the native always enjoys the view of the ocean and the feel of the salt sea breezes.

The seawall boulevard overlooking the gulf is one of the most delightful prominades in the world, and bathed in the sunshine of a Texas spring day, it offers a wonderful opportunity to enjoy a sight of the sea.

Galveston is an ideal convention city —the playground of the Southwest and the Atlantic City of the South. But not alone for the natural beauties is it an interesting place to visit. One cannot but admire, as one views the engineering works which protect the city from the sea and connect the island with the mainland, the courage and confidence with which a wonderful people have forged ahead with the building of their city.

Galveston invites you—come.

Kansas City, Mo.—James F. Holden of Kansas City, vice president of the Kansas City Southern railway will be one of the principal speakers at the annual convention of the Western Petroleum Refiners Association which will be held at the Hotel Galvez, Galveston, Texas, April 10, 11 and 12. Mr. Holden will speak on "Railroads and Oil Traffic", a subject which will include the various phases of transportation and allied traffic matters in which the entire refining industry is intensely interested.

Other speakers will include Judge C. D. Chamberlin of Cleveland, secretary and general counsel of the National Petroleum Association; D. W. Moffitt of Tulsa, vice president of Cosden & Company; Richard F. Whitney of Tulsa, district manager of the American Appraisal Company; V. G. Cunnington of Baltimore, president of the Commerce Trust Company; Roy B. Jones of Dallas, president of the Panhandle Producing and Refining Company; Phillip W. Babcock of New York, oil exporter; A. J. Callaghan of Jackson, Mich., vice president of the American Oil Men's Association; Oscar H. Williams of Kansas City, president of the Mutual Oil Company and others.

The election of officers for the ensuing year will be held Thursday afternoon, April 12, at the business session which will be presided over by George N. Moore of Chicago, president of the Western Petroleum Refiners Association. Present officers of the association besides Mr. Moore are Judge J. A. Germany of Dallas, Texas, and W. L. Kistler of Chicago, vice presidents, and John D. Reynolds of Kansas City, secretary and treasurer.

The association's annual banquet will be held Thursday night at the Hotel Galvez, beginning at 7:30 o'clock. Pat Malloy of Tulsa, president of the Constantin Refining Company, will act as toastmaster and speakers will include Judge William H. Atwell of Dallas, who will speak on "Texas Now the Empire State"; Robert L. Welch of New York, secretary of the American Petroleum Institute, whose subject

is "Petroleum"; and Harry T. Snell of Chicago, superintendent of The Texas Company, who will speak on "How Would the World Revolve Without Petroleum". Following the banquet there will be dancing.

The complete program as announced here by Secretary Reynolds follows:

Tuesday, April 10, 1923

10 a. m.—Registration at secretary's headquarters of the association, Hotel Galvez.

12:30 p. m.—Luncheon at Hotel Galvez. Following the luncheon, annual reports of president, secretary and treasurer, Washington counsel, commerce counsel and standing committees; Railroads and Oil Traffic" by James F. Holden, vice president of the Kansas City Southern Railway, Kansas City, Missouri; "How Legislation Inimical to the Oil Industry Should be Opposed" by Judge C. D. Chamberlin, secretary and general counsel of the National Petroleum Association, Cleveland, Ohio.

Where they load and unload crude and refined products at Galveston. The Mexican Petroleum Company docks shown in the foreground

Wednesday, April 11, 1923

12:30 p. m.—Luncheon, Hotel Galvez. Following the luncheon: "Petroleum Marketing Problems" by D. W. Moffitt, vice president of Cosden & Co., Tulsa, Okla.; "Disinterested Appraisals, Their Utility In Refinery Operations" by Richard F. Whitney, district manager of the American Appraisal Company, Tulsa, Okla.; "Financing Refiners' Stocks and Storage" by V. G. Gunnington, president of the Commerce Trust Company, Baltimore, Md.

Thursday, April 12, 1923

9:30 a. m.—Breakfast, Hotel Galvez. Following the breakfast: "Petroleum Manufacturing Problems" by Roy B. Jones, president of the Panhandle Producing and Refining Company, Dallas, Texas; "Why Ocean Freight Rates Should Be Reduced From Gulf Ports to European Countries" by Phillips W. Babcock, oil exporter, New York; "In the Interest of All, Opposed to None" by A. J. Callaghan, vice president of the American Oil Men's Association, Jackson, Michigan; "Wyoming As an Oil State" by Oscar H. Williams, president of the Mutual Oil Company, Kansas City, Missouri; business session, President George N. Moore presiding; election of officers for ensuing year; unfinished business; adjournment.

7 p. m.—Annual banquet at Hotel Galvez. Toastmaster: Pat Malloy, president of the Constantin Refining Company and past president of the Western Petroleum Refiners Association of Tulsa, Oklahoma. "Texas Now the Empire State," by the Hon. William H. Atwell, judge of the United States District Court, Dallas, Texas; "Petroleum" by Robert L. Welch, secretary of the American Petroleum Institute, New York; "How Would the World Revolve Without Petroleum" by Harry T. Snell, superintendent of the Texas Company, Chicago; dancing.

Small Refiners Will Benefit by New Bill

Washington, D. C.—Small independent refiners of the country, particularly those in sections of the Mid-Continent field where low grade crude is produced, are to be benefitted if a proposed bill is introduced at the next session of congress, understood to be sponsored by Congressman E. B. Howard of Tulsa, Okla. The bill would direct the United States Bureau of Mines to extend its chemical research work to a point where the independent refinery interests can get as much gasoline out of crude oil as now is being obtained by the Standard Oil Companies under the Burton process.

Regarding the proposed measure, Congressman Howard has been quoted as saying: "It is well known among oil men that independents on an average do not get nearly as much gasoline from crude as does Standard Oil. Standard Oil has the Burton process patented and thereby protected. There is no reason why the whole industry should not have developed for it a process that will make the refining of oil more profitable.

"The purpose of the Bureau of Mines is to aid the mining and oil and gas industries in behalf of the industries and the public. I can see no reason why chemists and petroleum engineers in the bureau should not develop a process as good as the Burton and let the oil world have the secret. That is going to come to pass if I can have my way about it."

The Beach at Galveston on a "busy" Summer day

Welcome

members of the Western Petroleum Refiners Association. While in the Gulf Coast we extend to you a cordial welcome to visit our refinery at Texas City, just across the bay from Galveston.

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Fuel Oil Bunker Oil

Fleming Unit Has Unusually Large Capacity

Simplicity, reliability and quality of product among other attractions of this method

By H. S. Bell

The Fleming process for the manufacture of light hydrocarbons from those of heavier molecular weight has been attracting most favorable attention from refiners over the past two years. This system, the invention of Richard Fleming and now controlled by the Richard Fleming Company of New York City, was first installed on a commercial scale at the plant of the California Shell Company at Martinez and started operation in May, 1920. The fact that no changes of importance have been necessary testifies to the soundness of Mr. Fleming's original ideas.

Since the above date numerous further installations have been made and there are now running eight different plants ranging in daily throughput 200 to 3600 barrels. This system is being further installed in seven additional plants, all of which will be operating this spring.

The Fleming system is of the liquid phase shell type which type represents by far the greater proportion of the country's present cracking capacity. The process is so designed as to overcome many of the difficulties previously experienced with shell type apparatus.

The cracking reaction depends upon two factors, temperature and time, pressure being corollary only to maintain the system in the liquid phase.

Basic Principle

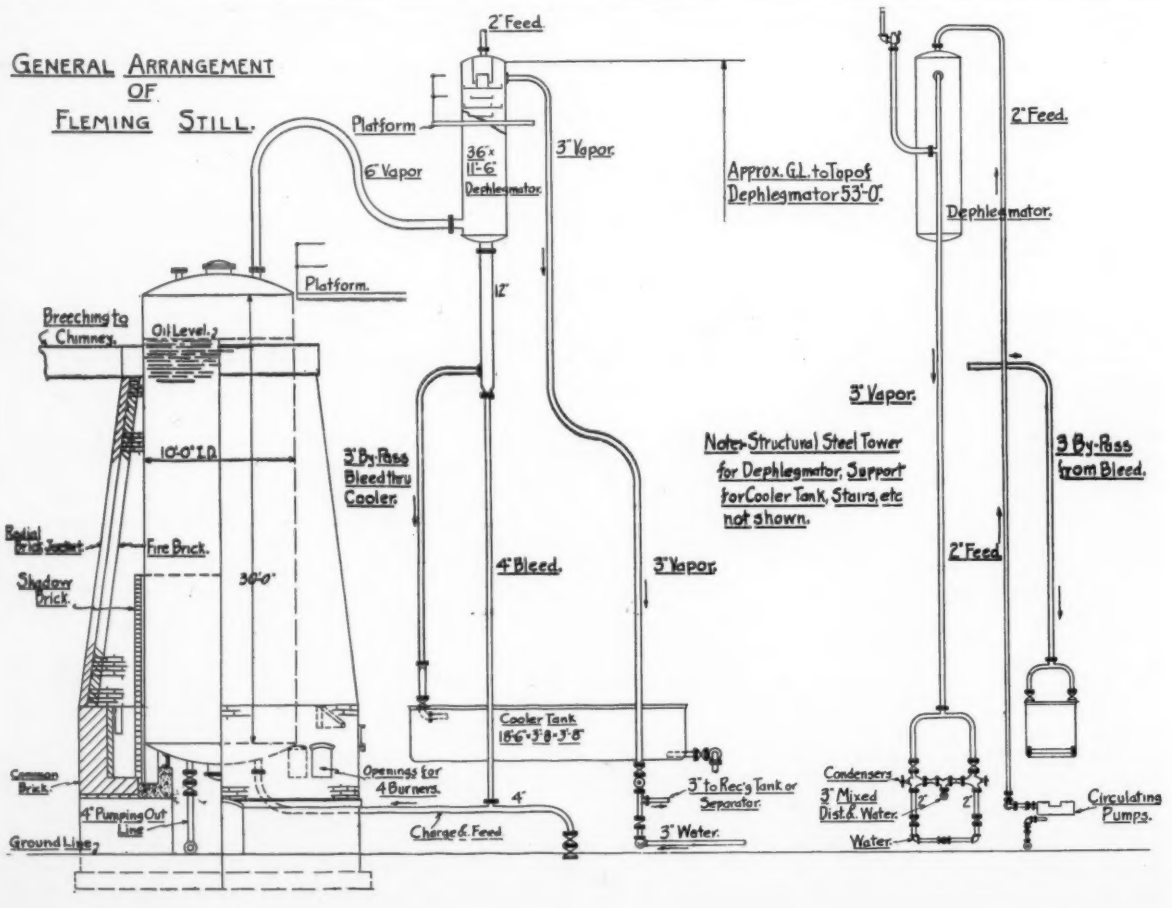
One of the basic principles of the Fleming process is that if the oil to be cracked is introduced into the bottom of a column of oil heated above the cracking temperature and the vapors removed from the top a definite time factor is introduced. Commercially this feature is attained by placing a 10 to 30 foot hammer welded still in a vertical position in an upright cylindrical setting so that the entire shell is exposed to the heat from furnace gases.

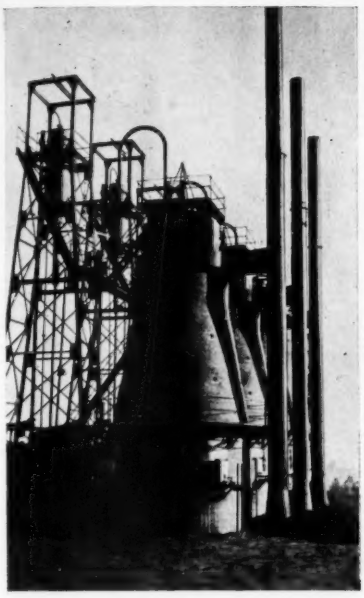
The bottom is protected from heat and the vapor space comprising approximately the top five feet is also outside of the setting, this latter portion being well insulated. This construction is shown by figure 1.

Referring to figure 2, which is diagrammatic of the piping, the vapors pass overhead to an open type combined scrubbing and dephlegmator tower where they meet and are scrubbed by the incoming feed. The feed carries the heavy ends back with same to the bottom of the still. Since it is estimated that the amount condensed and cut back by the dephlegmator amount to six or seven times the amount of final vapor allowed to escape to the condensers, there is a decided circulation from still to dephlegmator and back to still and each circuit must necessarily subject the oil to a definite length of exposure to cracking temperature.

This fact together with the large amount of heating surface accounts for the unusual capacity attained on a small unit.

The vapors leaving the dephlegmator are led to the condensers which are very novel in cracking technique. These condensers, one operating and one spare for each unit, are of the jet ejector type whereby the vapors are released between two cones of water. The sudden drop in volume of the vapors causes the peculiar phenomenon of a pressure still with condensers





A Battery of Three Fleming Units

working under a slight vacuum. It should be noted that the use of this apparatus combines a water cooler reducing valve and condenser all in one piece of equipment.

The jet condenser aids materially in the production of very excellent quality distillate. Scrubbing the hot gases with the water has the effect of removing many of the tarry bodies which lend pressure distillate color and odor. This is evidenced by accumulation of these bodies between the water and distillate upon standing. This fact, with the practical elimination of any vapor phase cracking, produces a distillate very easy of subsequent finishing.

The combined condensate and water is led to a separating tank where the water settles by gravity and the distillate is run to storage for subsequent distillation for its gasoline content.

Yield

The subject of yields is one which a refiner considering a cracking process should approach with caution. In general, subjecting a given oil to a given temperature for a given length of time will result in similar yields from any sound liquid phase process. To be of value yield statements must be analyzed with the throughput in mind.

The Fleming process is operating for yields on a "once through" basis of 35 per cent to 40 per cent of 437 degrees end point gasoline at its rated capacity of 200 barrels per day averaged over a sufficient period to include all idle time for cooling, cleaning, charging and raising to temperature. These results are obtained when operating at 110 pounds pressure in the still.

The charging oil is any clean overhead stock from 27 to 35 Baume gravity with initial boiling point temperatures of preferably 450 degrees F. or above. Very little difference in the commercial results are to be found in the wide range of conditions under which the stills are running.

The method of operation may be described as follows: The still is charged with 300 to 315 barrels, fires lighted and the pressure raised to operating conditions. The condensers are then opened and distillation started. While removing vapors cracking stock is fed into the top of the dephlegmator to maintain the oil level in the still. When the dephlegmator temperatures start to rise the circulating system is started. Referring to figure 2 a portion of the cut back is bypassed so that instead of going to the still it passes through a cooling box and is then introduced into the top of the dephlegmator with the feed. Increasing the amount of relatively cool oil entering the dephlegmator, of course, lowers the outlet temperature from same. Conditions are quickly reached whereby the system reaches a balance for the rest of the run.

The still remains on stream for 40 to 60 hours, the time being dependent upon the carbon forming qualities of the oil. During this time an amount of 250 to 350 barrels of gas oil or charging stock has been fed into the system in addition to the amount initially charged to the still.

Eliminates Horizontal Heating Surfaces

The still must then come down for removal of the carbon deposition, the formation of which is part of the cracking reaction and unavoidable. Referring to Fig. 1, it is noted that the Fleming system eliminates all horizontal heating surfaces. It is a well known fact that carbon does not attach itself so readily to a vertical hot surface as to one in a horizontal position. The nature of the deposit is more porous and it is more easily scraped away. A horizontal still with anywhere near such gasoline production would be shut down in a comparatively very short time.

After relieving the pressure and removing the residual the still is steamed and opened for cleaning. The vertical position, with manheads open, forms in effect a chimney which cools the still rapidly, allowing men to enter for cleaning. Cleaning is accomplished by manual scraping of the vertical surface with the men standing on a suspended iron platform within the still, said platform being raised and lowered by a chain passing through the top manhead to a small hand winch mounted on top of the still. The carbon falls to the bottom to be removed through the bottom manhead.

The entire idle time per cycle from off stream to again on stream consumes an average of 24 hours for relieving pressure, pumping out, steaming, cooling, cleaning, heating up, charging and getting up pressure again.

The above discussion is for a "once through" basis. If it is desired to recycle the charging stock left in the bottoms, the conventional procedure is to pump same to ordinary fire stills and distill to coke or very heavy residue and re-introduce the overhead from such distillation into succeeding pressure still runs. An interesting feature of the Fleming system is its ability to reclaim the available gas oil from the bottoms without the necessity of transferring and reducing. To take advantage of this feature one gas oil condenser of the surface type is installed for the battery of Fleming stills. When the run is over and the fires are drawn, the vapors are bypassed to this condenser. The large amount of heating surface to the volume of oil in the still and the gradual reduction of the pressure allows the operator to take off a second cut of 175 to 200 barrels of stock ready for introduction into succeeding runs without further treatment. Practical commercial net yields of 50 to 55 per cent are attained in this way.

Other operating characteristics of interest to refiners are fuel and loss. The former will average 8 per cent to 10 per cent of the throughput unless provision is made to burn fixed gas, in which case the above figures are cut approximately in half. The loss is between 4 per cent and 6 per cent of the throughput.

Labor Requirements

As to labor requirements, one operator and one helper on a shift will look after three units and with two helpers one operator can manage five units. The still cleaning gang is of course extra. Costs of cleaning are reported of from $12 to $16 per run.

The features which impress the refiner inspecting this process are the simplicity, reliability, quality of product and the extensive commercial background from actual operations.

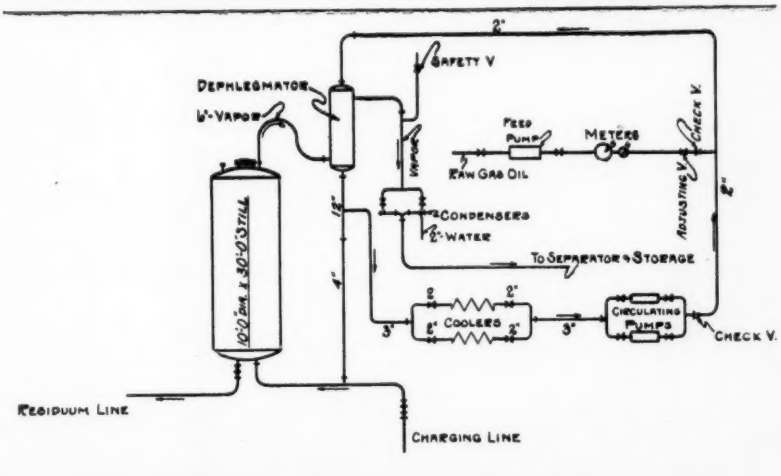


DIAGRAM OF PIPING FOR FLEMING STILL

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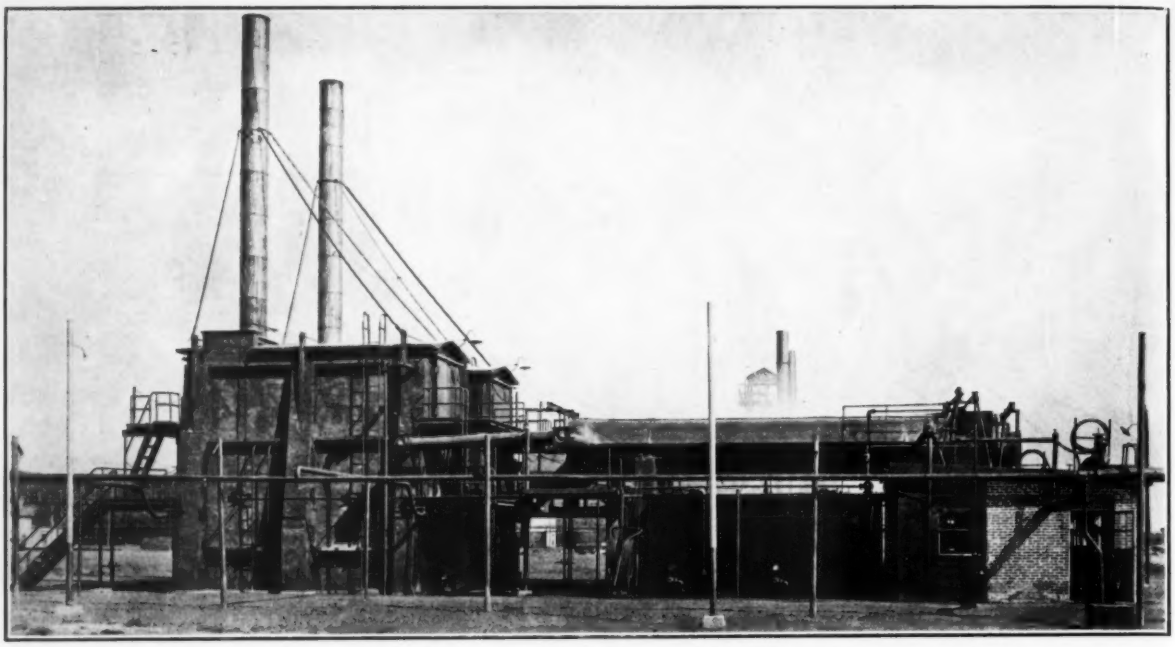


A complete two unit installation of the Cross Process

High Recovery Claim of Cross Process

Method is essentially a process producing a synthetic crude which is subsequently distilled

By Roy Cross

Never in the history of the petroleum industry has there been so much activity in methods of increasing the yield of gasoline from crude oil. During the last 12 months most important advances in practical cracking have been made.

In the past, cracking has been carried out in both the liquid phase and the vapor phase. Vapor phase processes with or without pressure are now almost entirely abandoned. Liquid phase processes, in which a large body of oil in a tank is directly heated, are becoming obsolete. Practically all commercial operations are going to liquid phase cracking in tube furnaces of various types. The real competition in cracking at this time is in the various types of tube furnaces.

The use of tube furnaces for the cracking of oil has theoretically existed for a long time. The Russian process of Schuchow and Gavrilow, patented by them in 1891, is essentially a tube still. The oil is passed through tubes from which it is discharged under pressure into a still and the gasoline taken off in dephlegmator towers. The residues both from the tower and from the still could be taken back through the tubes. This process is probably the basic one as applied to cracking oils by means of tube stills. The fact of the lack of satisfactory mechanical equipment and the lack of extensive use for gasoline during the period of the life of this patent, precluded its extensive use. The practice of tube still cracking at this time is really refinement of the Schuchow and Gavrilow process in most instances.

In the Cross process, while heating is effected in tubes in a furnace, the other conditions of operation are based upon more recently discovered scientific facts. These facts have to do with the relation between the pressure of gasoline and similar products to the temperature at which heavier hydrocarbons undergo decomposition into paraffin hydrocarbons. These facts are set forth in the Cross patents.

In a practical way the cracking of oil and the distillation of oil should be carried out separately. In the cracking it is desired that all the heat applied be used in the actual conversion into gasoline-like products. In the distillation the heat is consumed in volatilizing, or taking up, the latent heat of vaporization. It is, therefore, apparent that in any process which employs distillation simultaneously with cracking, the former operation will very materially retard the latter. One of the purposes of the Cross process was to overcome this very practical difficulty as applied to costs of operation. Incidentally the result of overcoming this difficulty was to present many other advantages.

Operates on All Products

The Cross process as now developed operates on all heavy products of petroleum for the cracking of these products into gasoline. It is essentially a cracking process producing a synthetic crude oil which is subsequently distilled. These cracking and distillation operations are separate and distinct with the result that the highest efficiency in both is obtained.

The distillation may be accomplished by allowing the freshly-made hot synthetic crude oil to vaporize by its own heat, or by cooling the synthetic crude and subsequently distilling it in the same manner that natural crude oil is distilled.

High Recovery

The Cross process produces 55% to 70% of "New Navy" gasoline from gas oil, 75% to 82% of gasoline from kerosene, and approximately 40% of gasoline from fuel oil. These figures are based on actual commercial operations. The process has, to date, commercially treated approximately 2,000,000 barrels of oil. This commercial operation has been carried out without so much as even a severe burn to any of the employees or operators.

The principal features of the Cross process are as follows:

1. **Low fuel cost.** Approximately 1% of fuel oil is required for cracking. If the synthetic crude is vaporized while hot this 1% of fuel suffices for both the cracking and the distillation. In the best of the pressure distillate systems at least 12% of fuel oil is required. This is a saving of at least 10 cents per barrel on fuel.

2. **The high yields.** The Cross process will produce while on stream at least 200 barrels of "New Navy" gasoline per day from 350 barrels of gas oil. This is a larger yield than is obtainable in a commercial way from any other process, and in practice means an additional profit of at least 20 cents per barrel of oil.

3. **The low labor costs.** The simplicity of operation allows the use of a minimum amount of labor (three men per shift per doublt unit), which based

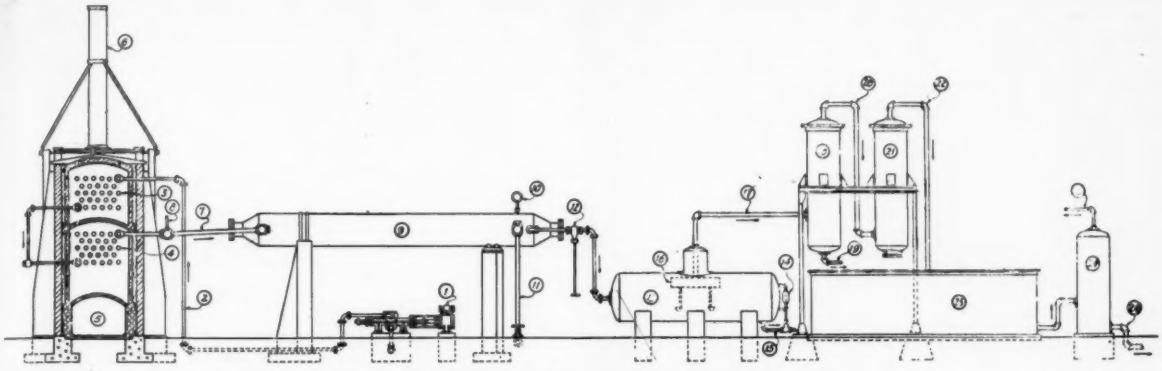


Fig. 1—Diagram of Cross Process using vaporizer and towers

on actual experience is approximately half of the best pressure distillate systems.

4. **The safety to employees.** The plant is so constructed that there is not a riveted or welded joint in any important part. The reaction chamber is forged out of a single ingot in the same manner that a large naval gun is made. Welded apparatus is known to be unsatisfactory on account of the liability of cracking due to expansion and contraction.

5. **Flexibility of the process.** The same installation will operate upon kerosene, gas oil or fuel oil and that product may be used, which under the prevailing commercial conditions is most profitable to use.

6. **The patent situation.** This liquid phase process is in a field by itself as to the license from litigation, first, on account of the dissimilarity of the patents from those of the pressure distillate systems, second, on account of the affiliations of the Gasoline Products Company with certain great oil groups and financial interests, and third, because of the sweeping protection and indemnity clauses of the license contract.

7. **License charge.** The royalty charge for the use of the Cross processes, is 5 cents lower than the closest competitive process.

The process is in operation in the refineries of the Pure Oil Company, Roxana Petroleum Corporation, Petroleum Refining Company, Indian Refining Company, Globe Oil and Refining Company and the Sapulpa Refining Company. These companies are building 30 additional units at this time. Plants are now under construction at the Sun Oil Company, the Clayton Oil and Refining Company, the Waite Phillips Company, Cory Bros., Ltd., and the Asiatic Petroleum Companies licensed to build and operate the process are the Indiahoma Refining Company, Interstate Refineries, and the Miller Petroleum Company.

One of the greatest fallacies now in the minds of many refiners is that it is profitable to crack fuel oil directly by means of pressure distillate pipe still installation. A careful analysis of the facts will show that it is far more profitable to separate the operation of distilling fuel oil and the operation of cracking the gas oil produced therefrom. In the pressure distillate systems there is a very small conversion of the oil into gasoline in each passage through the tubes. Before the ultimate cracking is obtained, the gas oil produced in the cracking tubes is refluxed from 10 to 20 times. This means that the oil actually under treatment at any one time after the plant is on stream is a mixture of not less than 90% of gas oil and not more than 10% of fuel oil. It is, therefore, a fallacy to speak of cracking fuel oil direct in this type of plant. It is also perfectly obvious that the license charge should not be made against the original fuel oil, but rather against the gas oil made from it.

The ideal method of treating fuel oil for gasoline is to first distill it with 65% overhead. This distillation is readily accomplished using an ordinary pipe still and vaporizer which is comparatively inexpensive equipment, and at a cost of not exceeding 12½ cents per barrel.

The Cross process will operate satisfactorily on fuel oil, but not so well or so profitable as in the case of kerosene, gas oil and wax distillate.

The general features of the operation and equipment of the Cross process are as follows:

Construction

The Cross process consists of a tube furnace of special construction, of a reaction chamber in which actual decomposition of cracking of the oil takes place, of a vaporizer from which the hot synthetic crude oil is distilled, towers from which the distillates heavier than gasoline are refluxed, a cooler or condenser box in which the crude benzine is condensed and cooled and a gas separator in which the permanent gas is separated from the synthetic benzine.

Instead of the vaporizer and towers, a heat exchanger may be used to cool the synthetic crude and to preheat the charged oil. In this case the synthetic crude is then brought to atmospheric temperature in the cooling box and the permanent gas is separated from the cold crude, the latter going to storage to be re-run at some later time.

In either case the gas is put into a gas holder or is immediately burned in the furnace of the cracking plant or elsewhere as desired.

Figure 1 shows a normal operating scheme of the process in which the synthetic crude oil is distilled while hot.

Gas-oil of 32-36° gravity is ordinarily used and is charged in by means of the pump (1) from a charging tank not shown in the diagram. This charging tank is kept supplied from oil refluxed from towers (18) and (21). The oil enters the furnace through line (2) going first to the top row of

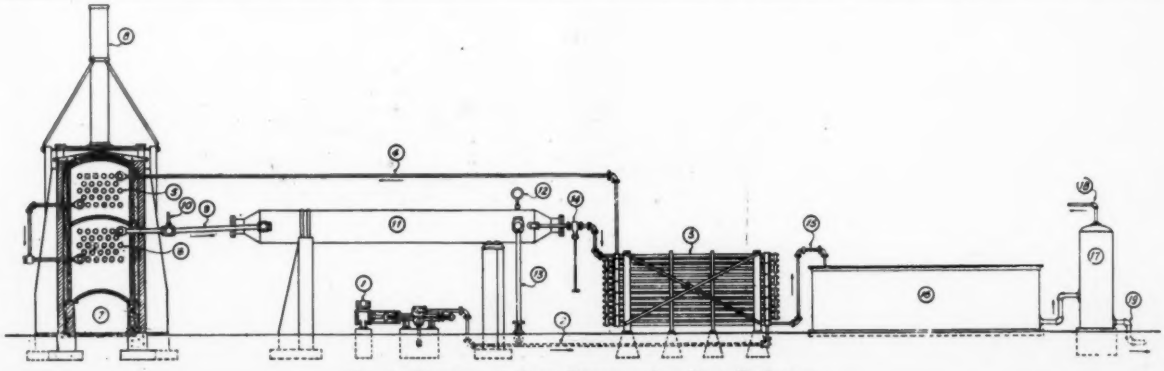


Fig. 2—Diagram of Cross Process using Heat Exchanger

XUM

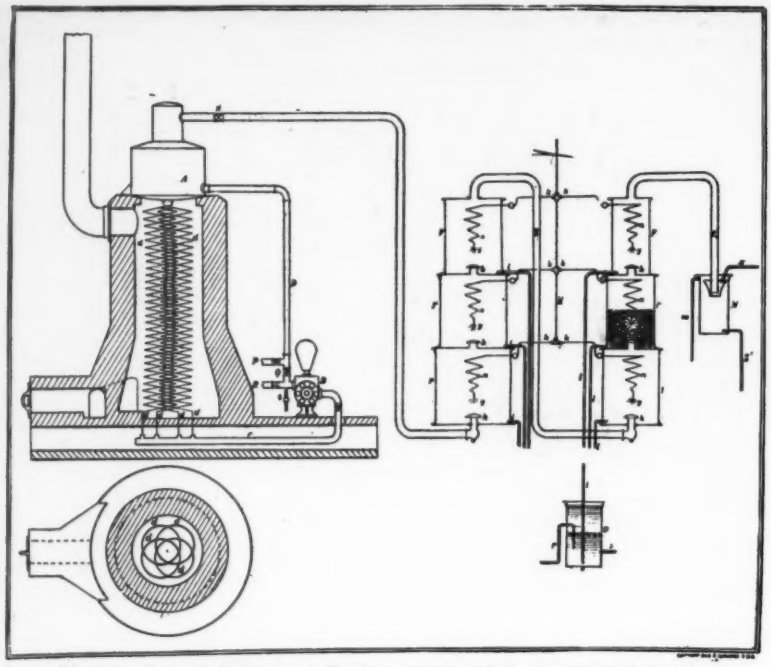


Diagram of the Schuchow and Gavrilow process which was patented in 1891

the preheater tubes, thence down through these tubes (3) out of the lower row of tubes and into the heating tubes (4). These tubes are all arranged in series with return bends and with no multiple headers. The oil goes at such a rate of speed and with such a rate of application of heat that there has been very little chance for cracking in them. The oil heated to a temperature of approximately 850° F. is discharged through the line (7) into the reaction chamber (9). In this reaction chamber the decomposition of the oil and a decomposition of carbon takes place. This oil ordinarily is held there at least 15 minutes although at all times there is a relatively small amount of oil undergoing decomposition. The pressure on the tubes and in this reaction chamber is normally 600 pounds. From here the oil discharges out through the special valve (12) into the vaporizer (13). This vaporizer is thoroughly insulated so that as much as possible of the heat is utilized in vaporizing and without radiation. The oil vapor passes through the vapor purifier (16) which takes out the suspended liquid particles of "smoke". This vapor passes through the insulated line (17) into the tower (18) which is equipped with plates and baffles and into fresh and cold gas which is continually pumped at such a rate that the temperature at the top of tower (21) does not ordinarily exceed 440° F. The oil refluxed from tower (18) goes into a charging tank not shown. Tower (21) in the same manner acts as a dephlegmator apparatus to get a good end point on the benzine. This tower has a reflux line which also goes into the charging stock. This reflux line is not shown on the sketch. The separated benzine together with the permanent gas now passes over the line (22) through the coils in condenser box (23) and into the gas separator (24) from which benzine is continuously fed into the fire box (5) through the line (25).

In the normal operation after the plant is on stream, the gas is sufficient to operate the plant. The fuel oil in vaporizer (13) is normally about 10% and is maintained at a constant level by means of the level apparatus (14). It is discharged from the line (15) as released by the automatic valve and passes ordinarily through a separate coil in the box (23).

The plant is controlled by means of the temperature indicated in the box elbow (8) by the furnace temperature and by the difference in gravity between the incoming oil in the line (2) and the synthetic crude at the point (12). Ordinarily, this difference in gravity is from 4° Baume to 5° Baume. The furnace temperature is normally 1350° Fahrenheit; the stock temperature is normally from 600° Fahrenheit to 700° Fahrenheit.

In the ordinary running of the process using 34 gravity gas oil, there is 10% of fuel oil taken from the vaporizer (13), 54% of re-running stock refluxed from the towers (18) and (21) and 33% of synthetic gasoline taken out of the line (26). This last refines to about 31% of new navy gasoline. If the re-running stock is subtracted from the amount charged the yield of gasoline is something over 60% based upon the fresh oil charged. With the towers as just described the new unit handles 1,000 barrels of total oil or about 500 barrels of fresh oil and produces approximately 330 barrels of gasoline per day.

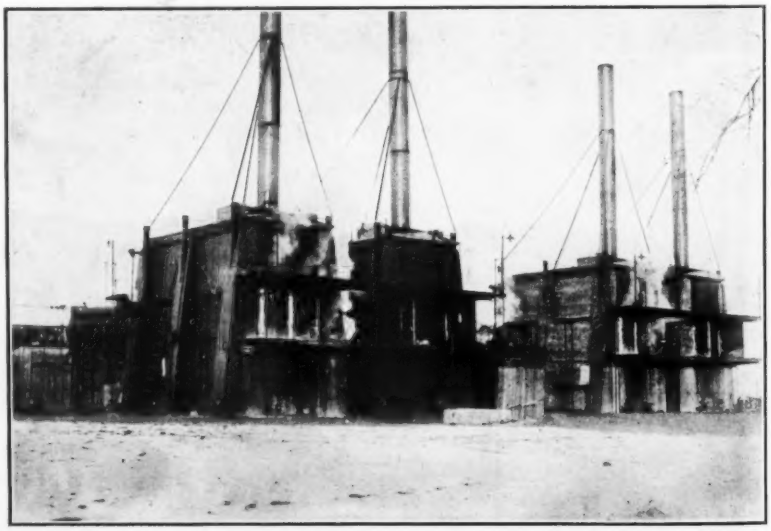
Figure 2 shows the arrangement when the heat exchanger is used instead of the towers. From the reaction chamber (11) the oil is discharged through slide valve (14) through the heat exchanger (3) and into the cooling box (16). The cold synthetic crude is relieved of the permanent gas in the gas separator (17) and is sent to storage through the line (19).

In the plants that have been placed in operation with the use of heat exchanger approximately 850 barrels of oil are treated per day producing approximately 275 barrels of gasoline. Operating without the heat exchanger, but with vaporizers and the towers 650 to 700 barrels per day are treated yielding approximately 200 barrels of gasoline.

In the plants now being erected the heating area in the furnace tubes has been increased to approximately 50%, making a daily through-put of approximately 1200 barrels per day using the heat exchanger and 1000 barrels per day using the vaporizer and towers.

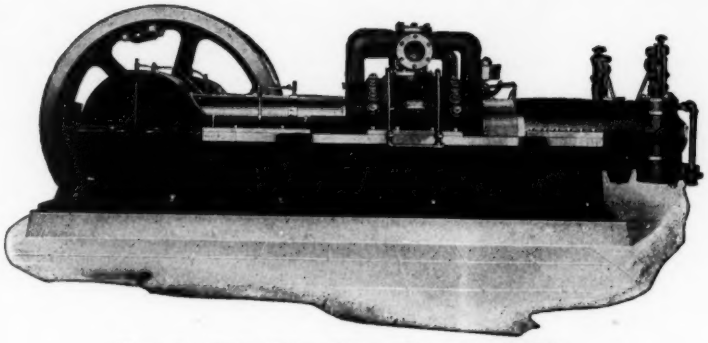
Comparative Costs

The following summary of operation on the typical light and crude oil shows very clearly the advantages to be gained by installation of cracking units



A four unit installation of the Cross Process

THE NEW ENCLOSED TYPE



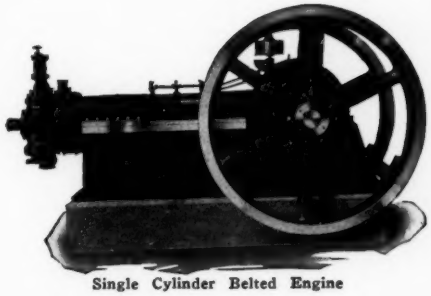
Direct Gas Engine Driven Vacuum Pump, Two Cylinder

Watts-Miller Gas Engines and Direct Gas Engine Driven Compressors and Vacuum Pumps

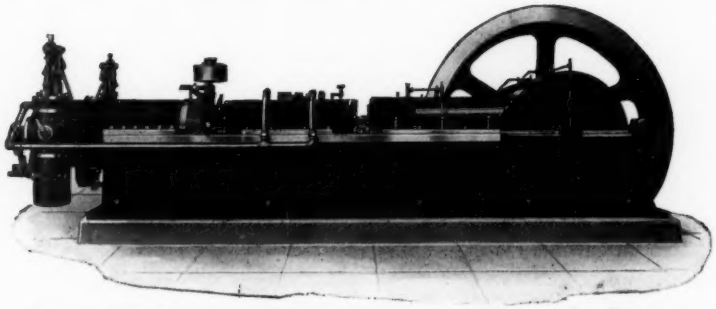
Pat. June 22, 1897; Oct. 6, 1914; April 13, 1915

High Efficiency Gas Engines, Compressors, and Vacuum Pumps for Power Plant Equipment

Sizes from 25 to 400 h. p.



Single Cylinder Belted Engine



Direct Gas Engine Driven Compressor, Two Cylinder, Single or Two Stage

Compressors particularly adapted to casing-head gasoline plants, gas pumping plants, and compressed air installations, in single and 2-stage machines to operate on practically all intake and discharge pressures.
Continuous circulating filtering automatic oiling system.

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Gasoline Men's Meet Is to Be Largest Yet

Tentative program promises interesting sessions for those that attend spring gathering at Tulsa

Tulsa, Okla.—Dates for convention of the Association of Natural Gasoline Manufacturers to be held here have been set for April 24, 25 and 26. The convention will last three days. Two of these will be given over to business and entertainment. The third day will consist of visits to various natural gasoline plants in Oklahoma, with a visit of inspection to the experiment station of the United States Bureau of Mines at Bartlesville.

Arrangements are being made to entertain about 400 during the three days. A. V. Bourque, secretary of the organization, has charge of details of the program and the entertainment that will be a part of the convention.

The tour of plant inspections for the third day of the program is expected to prove a popular feature of the convention. The trip will be made in automobiles, which will be furnished by members of the organization in Tulsa. The large absorption plants around the Burbank pool of Osage County will be visited first. Then the refining plant of the Barnsdall Refining Company at Barnsdall, Okla., will be visited. Methods of blending will be demonstrated here. Lunch will be served at this plant. Then the visitors will go to Bartlesville to inspect the Bureau of Mines Experiment Station, after which they will return to Tulsa.

The program of the convention is not yet complete. The tentative program follows:

First Day

Morning—Address of welcome, D. F. Buchanan, Tulsa, Okla.; annual address, President W. M. Welch, Tulsa, Okla.; "Development of the Natural Gasoline Industry in Wyoming", Dr. C. K. Francis, chief chemist, Producers and Refiners Corporation, Tulsa, Okla.; "Development of the Natural Gasoline Industry on the Pacific Coast", Kenyon L. Reynolds, assistant general manager, Pacific Gasoline Company, Los Angeles, Calif.; "A Comparison of Natural Gasoline Production Methods" (illustrated), J. A. Rafferty, general manager, Carbide and Carbon Chemicals Corporation, New York, N. Y.

Night—Address, R. L. Welch, general secretary, American Petroleum Institute, New York.

Second Day

Morning—Business meeting of the association, election of officers, etc.; "The Charcoal Process", Col. George A. Burrell, Pittsburgh, Pa.; "Safe Transportation of Gasoline", Col. B. W. Dunn, chief inspector, Bureau of Explosives, New York.

Night—Annual banquet at Hotel Tulsa. Toastmaster, D. E. Buchanan, Tulsa, Okla. Speaker to be selected.

Third Day

Automobile trip to natural gasoline plants of Skelly Oil Company and Phillips Petroleum Company in Osage County. Visit to Barnsdall Oil Company's refinery at Barnsdall, Okla. and inspection of Bureau of Mines Experiment Station at Bartlesville, Okla.

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of any type which are highly economical.

Skimming Operations

(Refining 39° Be. Burkburnett Crude)

Costs—

2,500 bbls. crude oil at $2.75 per bbl.	$6,250.00
Skimming at 35 cents	850.00
Total costs	$7,100.00

Income—

850 bbls. natural gasoline @ 14 cents, $5.88	$4,998.00
250 bbls. water white kerosene (4 cents) @ $1.68	420.00
1325 bbls. fuel oil @ $1.15	$1,524.00
Total income	$6,942.00
Loss	$ 158.00

Cracking and Skimming

Costs—

2,500 bbls. crude @ $2.75 per bbl.	$6,250.00
Skimming at 35 cents	850.00
Cracking and treating cost	550.00
Total costs	$7,650.00

Income—

850 bbls. natural gasoline	$4,998.00
525 bbls. synthetic gasoline	3,087.00
1,000 bbls. fuel oil @ $1.15	1,150.00
Total income	$9,235,00
Profit	$1,585.00

DEPARTMENT OF THE INTERIOR, BUREAU OF MINES - OUTPUT BY SECTIONS OF THE REFINERIES IN THE UNITED STATES FOR 1922.

	RUN TO THE STILLS CRUDE OIL (bbl)	RUN TO THE STILLS OTHER OILS (bbl)	GASOLINE (gal)	KEROSENE (gal)	GAS & FUEL (gal)	LUBRICATING (gal)	WAX (lb)	COKE (ton)	ASPHALT (ton)	MISCELLANEOUS (gal)	LOSSES (bbl)
EAST COAST	100,524,654	10,320,410	1,161,493,123	555,247,665	2,070,486,233	305,679,454	195,863,729	230,299	886,496	100,121,057	4,425,600
PENNA.	20,660,845	1,485,465	298,207,142	142,790,834	207,473,117	158,412,181	75,884,510	20,026	3,814	48,045,916	1,259,652
IND. AND ILL.	45,606,046	4,061,851	888,537,636	198,407,285	646,819,146	76,008,022	33,806,740	178,189	108,584	118,187,724	1,977,774
OKLA. and KAN.	70,934,293	6,265,577	1,167,264,893	331,706,142	1,341,815,776	75,302,787	28,283,275	23,480	- - - -	196,122,073	2,877,287
TEXAS	100,696,083	7,063,261	1,057,994,183	560,402,895	2,249,021,992	230,256,033	51,033,948	106,778	358,127	169,269,687	4,216,525
LA. and ARK.	34,864,586	1,878,471	365,829,696	211,397,748	641,561,277	32,621,870	46,669,104	89,192	232,093	150,951,837	839,204
COLO. and WYO.	24,390,940	14,621,442	569,510,192	111,081,891	517,193,319	18,823,596	30,004,503	59,100	1,644	349,939,488	1,201,600
CALIFORNIA	103,028,169	8,901,774	693,497,748	195,292,029	3,031,855,710	81,648,526	457,370	- - - -	894,499	555,814,671	1,765,381
TOTAL 1922	500,705,616	54,598,251	6,202,234,613	2,306,336,489	10,706,226,570	978,752,469	462,003,179	707,064	1,895,257	1,688,452,453	18,562,025
TOTAL 1921	443,362,657	36,492,565	5,153,549,318	1,945,126,156	9,663,816,135	877,859,074	433,887,214	604,465	1,214,536	1,202,433,163	19,557,547
TOTAL 1920	433,915,029	40,234,591	4,882,546,649	2,320,095,443	8,861,451,931	1,046,708,349	541,404,537	576,613	1,290,614	1,492,583,526	18,742,939
TOTAL 1919	361,520,153	45,762,616	3,957,857,097	2,341,632,164	7,627,288,566	846,760,017	467,235,223	603,459	901,885	1,278,863,780	16,015,226
TOTAL 1918	326,024,630	50,565,204	3,570,312,963	1,825,360,137	7,321,397,557	841,465,767	505,144,357	559,663	607,968	1,286,710,383	14,596,625
TOTAL 1917	315,131,681	14,897,670*	2,850,546,423	1,726,768,976	6,513,324,280	753,776,840	481,200,081	539,366	7 39,425	702,167,243	13,073,829
DAILY AVG. 1922	1,371,796	149,584	16,992,424	6,318,703	29,332,128	2,681,514	1,265,762	1,937	5,192	4,625,897	50,855
" " 1921	1,214,692	99,980	14,119,313	5,329,113	26,476,209	2,405,093	1,188,732	1,656	3,327	3,294,337	53,582
" " 1920	1,185,560	110,177	13,340,291	6,339,059	24,211,617	2,859,859	1,479,247	1,575	3,526	4,078,097	51,210
" " 1919	990,466	125,278	10,843,444	6,415,430	20,896,681	2,319,891	1,280,087	1,653	2,179	3,503,736	43,877
" " 1918	893,218	138,535	9,781,679	5,000,987	20,058,623	2,305,386	1,383,957	1,533	1,666	3,525,234	39,881
" " 1917	863,374	40,966	7,809,716	4,730,874	17,844,734	2,065,142	1,318,356	1,478	2,026	1,923,746	35,815

* Total last six months

Electric Sparks Are Used in Stevens Process

Catalytic surface kept clean of carbon in manner that has proved to be success

By E. Webster Stevens

Of late years the relative small percentage of gasoline naturally present in crude petroleum, combined with the high price of motor fuel as compared with other products from crude oil, has caused much study and research to be given to the art of "oil cracking", with the object of changing a portion of the low value higher-boiling fractions into those of the more valuable low-boiling ones.

Certain results obtained for the first time in this important art, by the writer, leads to the presentation of this article as both the fundamental theories adopted and the method of their application will be recognized as new and original.

It is a well known fact, that aside from a slightly different molecular arrangement, gasoline contains but from ½% to 2% more of hydrogen than is present in the relatively heavy gas oil or fuel oil fractions of the crude, therefore the problem of changing the higher boiling fractions to lower boiling ones would seem to consist in greater part of only a small amount of molecular rearrangement, and the addition of a little hydrogen, and it would also appear that the common practice as usually pursued of actually disintegrating or cracking the oil, with the natural result of the releasing of large quantities of fixed gas, and the depositing of great percentages of carbon and coke, is certainly going much farther to accomplish the result than there is actual need for.

Then if a slight molecular change, and the addition of a little hydrogen to the oil are the principle requirements, it becomes obvious that the reactions which we are striving for should be conducted under the most favorable chemical conditions. In this connection two well known facts are common knowledge (1) that the German chemist Ubbelohde, whose findings were published in 1912, found that lighter distillates were produced from heavier hydro-carbons at some 200° Fahrenheit lower temperature if the cracking is carried on in the presence of a catalytic material, and (2) Doctors Zanette, Ipatiev, Engler, Kuznetzov and others have shown that various metals, such as alumina, nickle, titanium, chromium, etc., are effective as catalysis, but all these worthy investigators observed that the active surface of the catalysis would become non-effective after but a few minutes of operation, through a deposit of carbon on the catalysis surface.

It is thus noted it was apparent to the writer at the outset of the work here described that greatly superior results could probably be obtained if a catalytic material could be used, and a way found to eliminate certain drawbacks in connection with its use, the principal one of which was the stopping of its activity by carbon deposit.

Various ways were tried out and a method was finally adopted, consisting of the spraying or bombarding of the catalytic surface very thickly, with electric sparks. That this was entirely effective is shown by the fact that almost daily runs were made with the standardized tube outfit shown in Figure 1, over a period of nearly a year, and at the end of the runs the covers would be taken off the hydrogenation tube ends and a ball of clean white waste, or the observer's clean handkerchief would be rammed through the tube, without showing the slightest trace of soot or carbon.

The apparatus shown in figure 1 was constructed to demonstrate the correctness of the writer's theories mentioned in the preceding paragraph and to prove the ability of a suitable catalysis to bring about the desired change in the higher boiling oils to produce the lower boiling gasolines, at the relatively low temperatures of from 700° Fahrenheit to 800° Fahrenheit, at atmospheric pressure. The successful accomplishment of this is proved by the fact that in hundreds of runs with the apparatus operating on various kinds of paraffin and asphaltum base oils, from 86% to 92% of kerosenes, gas oils, lubricating oils, down to the "bottoms", were repeatedly turned into a good water-white, saturated, United States navy specification gasoline, at an estimated large operation cost of less than a cent a gallon.

Fig. 2

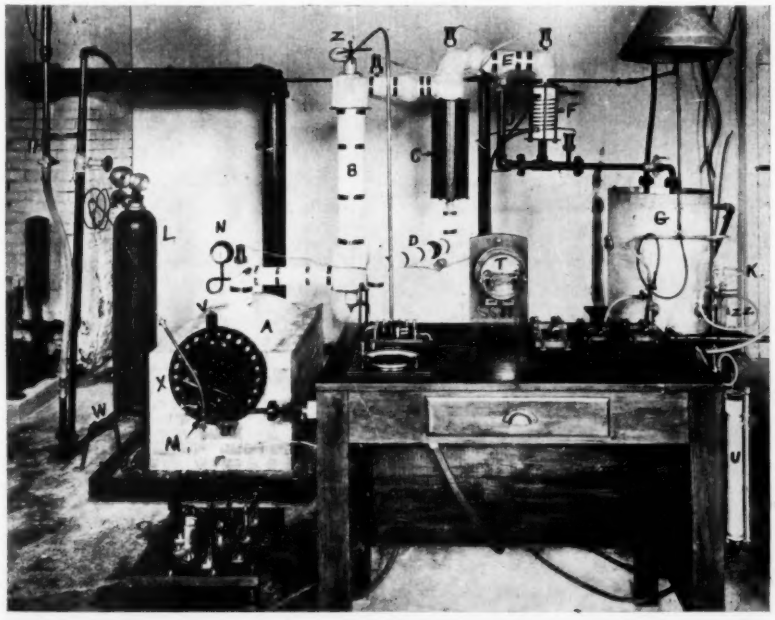

Fig. 1

The Standardized Tube

At the outset of these investigations it was recognized that the turning of a large percentage of kerosene or fuel oil into a water-white, sweet-smelling, definite-percentage-boiling-point gasoline could not be successfully accomplished in any such haphazard a manner as the oil cracking fraternity had always seemed to think possible, by simply heating the oil in a tank still and keeping it liquid by pressure, or running it through an indifferently heated pipe. It was also plain that while such aid as a clean catalysis was beneficial, at the same time the reaction must be kept under control by the maintenance of a correct hydrogen-rich atmosphere in the hydrogenation tube, so that the reaction would proceed at the proper rate and in the direction desired. It was also essential that the various fractions of oil vapors should have varying degrees of

heat applied to them to produce a finished gasoline of the boiling-point-specifications desired.

In curve "B", figure 3, is shown a synthetic gasoline produced from ordinary Cushing, Okla. fuel oil, compared with (curve "A") a straight-run, uncracked gasoline skimmed from a light Kentucky crude. This product was water-white, sweet-smelling, iodine number 29, gravity 59 Baume, and 82% of the fuel oil charged into the still was turned into gasoline of the curve shown.

In figure 4, curve "A" represents a synthetic gasoline produced from an asphaltum base Mexican crude, formerly containing no gasoline, compared with (curve "B") a straight-run gasoline skimmed from a Kentucky light crude oil. Eighty-one per cent of the oil charged into the still on this run was turned into gasoline of the boiling point percentages shown.

The positive control of the various conditions necessary for the successful hydrogenation to lower boiling points of a heavy petroleum oil, is not necessarily intricate or difficult. Figure 1 shows the assembly of the standardized single tube outfit with which the results obtained were repeatedly demonstrated. "A" is a batch or continuous atmospheric pressure tank still, fired with gas from burner "W". Hydrogen or natural gas from tank "L" is metered through disc "M" and mixes with the hot oil in the still and rises along with the vapors into hydrogenation tube "B". This tube is made up of various catalytic materials of proportions to secure the greatest activity, and is heated electrically by transformer "S".

The inside of tube "B" is bombarded by numberless high tension electric sparks from an electrode suspended in center of tube. These sparks are sprayed through the wall of a porous tube of catalytic material. This porous tube is ¼" less in diameter than the inside of the metallic catalytic tube, and the outside of this inner tube is ringed on its surface to form a series of venturi shapes, and as the vapor passes between the outside of this tube and the inside of tube "B", a maximum number of vapor contacts is obtained against the catalysis tube surfaces.

"C" is a dephlegmator which separates any high-boiling-point oils not reduced to gasoline in one cycle, and sends them back to the still through pipe "D" for re-circulation. The gasoline-boiling-point fractions pass out the top of dephlegmator "C", through pipe "J" to the water-cooled condenser "G". At first it was thought that a secondary hydrogenation would be essential, and "F" was included for this purpose, being cut in or out by valve "E", but its use was never found necessary as the maintenance of a correct atmosphere in tube "B" together with the application of the proper degree of heat, was found capable of producing a motor fuel of a degree of saturation as low in iodine number as ordinary commercial straight-run gasoline.

"N" is a vacuum-pressure gauge for the regulation of the flow of hydrogen. At the left, on top of control table, is shown a pyrometer for noting temperatures at points in the system indicated by the numbered thermocouples.

"T" is an indicating watt meter to register the amount of electricity used. Gasoline flows from the coils of condenser "G" into graduated bottles at "ZZ". Gas sample analysis bottles are shown at "K". No non-condensable or fixed gas was produced at any time with the active catalysis and the low temperatures used.

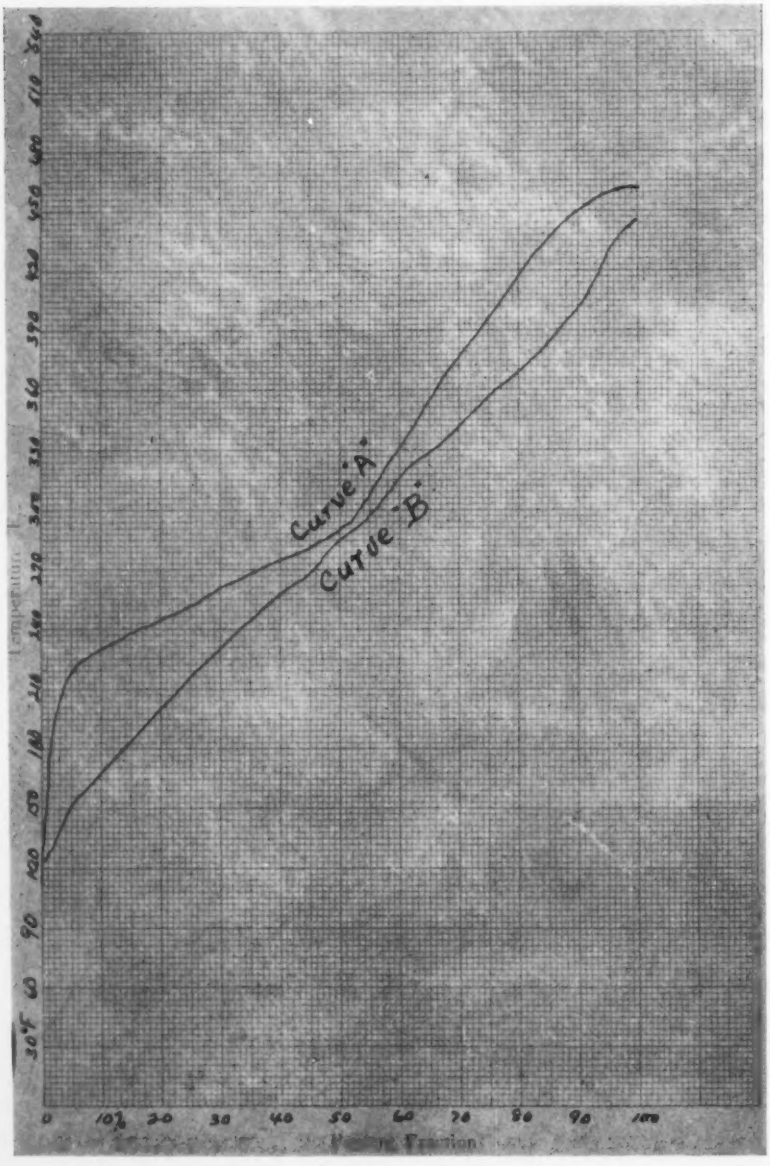

Fig. 3

Refinery Installation

Figure 2 shows a hydrogenation unit of 36 tubes, with outside cover removed. This is heated by oil or gas, the burner opening being shown near the bottom of the circular base. The heating flame is admitted at an angle, circulates around the brick-lined center, and after combustion is complete, the hot gases escape from the combustion chamber through slots (seen dimly) between the tubes, thus distributing the heat uniformly over the entire tube surface.

To secure a gasoline output about equal in speed of conversion to the better known pressure oil cracking processes, a unit of four of these 36-tube banks is connected in the vapor line (together with a dephlegmator) between the still (500 barrels) and its condenser. When the ordinary gasoline-skimming operation is completed, heat and electricity are applied to these hydrogenation units, and the kerosenes, gas oil, and fuel fractions of the crude are converted into gasoline. About 10 watts of electricity and three-fourths of a cubic foot of "natural", or any hydrogen rich gas, are consumed per gallon of gasoline produced.

On the floor at the right of the unit in figure 2 is shown a single tube assembly, consisting of the insulating high-tension terminals, with its vapor inlet connection near the upper end, and the outlet at the bottom. Between the tube and the hydrogenation unit is the catalytic porous tube, the function of which has been previously described elsewhere in this article.

A molecular analysis of some samples of the synthetic gasoline produced

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was made by the Gruenberg Organic Laboratories of New York City. It was found that no cracking, that is, no actual disintegration of the hydrogen and the carbon elements of the oil, takes place with the lower temperatures used, and in instances where the atmosphere in the hydrogenation tube was allowed to become starved of hydrogen, the reaction would proceed toward the formation of aromatics. As high as 58% of a toluol-benzole-xylol mixture was found present in one sample.

I want to take this opportunity to publicly express my appreciation of the encouragement given me in this work by the following gentlemen: Dr. Virgil Coblentz of the Coblentz Laboratories, New York City; Dr. Louis Reis, former research chemist of the Tidewater Oil Company, New York; Dr. E. R. Lederer, superintendent of the Louisiana Oil Refining Corporation, Shreveport, La., and Dr. P. W. Wilkins, superintendent of the Moore Refining Company, Arkansas City, Kans.

Intrastate and Northwestern Rates Will Be Taken Up by Traffic Managers

Oklahoma City, Okla. — Intrastate rates on petroleum products in Oklahoma as well as efforts to have through rates established in the northeastern territory will come before traffic managers of the Western Petroleum Refiners Association for consideration here March 20. The meeting will be held in the Lee Huckins hotel.

In his official notification of the coming meeting, J. F. Lawrence has this to say regarding the Oklahoma rates:

"The carriers have cancelled certain crude oil rates in the state of Oklahoma, which is of a great deal of importance to many of our members, and it occurs to me may be the first step on the part of the carriers to increase rates in Oklahoma, Kansas and Texas, and therefore, might have a far reaching effect."

Oklahoma City was selected as the place for the coming meeting in order to have increased attendance of Texas members. Responses from members of the Lone Star State have indicated that this will be one result of having the meeting here.

The decision to meet here in April follows a meeting in Kansas City February 9. At that time the organization went on record as to serve with several railroads of the northwest in having advance information on all rate changes to destination from the Wyoming oil fields on petroleum and its products.

The association was also instructed to handle with W. R. Boyd, Jr., of the American Petroleum Institute with the view of developing with Colonel Dunn a system of advising members of all regulations covering shipments of inflammables by freight and express.

Through a resolution the traffic managers expressed appreciation to Frank Carter, chairman of the Oklahoma Corporation Commission, for his action intervening before the Interstate Commerce Commission in behalf of oil shippers in Oklahoma, involving rates from Oklahoma to Indiana.

Those attending the Kansas City meeting were: B. J. Burchett, Shaffer Oil and Refining Company, Chicago, Illinois; A. T. Sindel, Western Petroleum Refiners Association, Kansas City, Missouri; L. D. Summerwell, Kansas City Refining Company, Kansas City, Missouri; E. E. Harrington, National Refining Company, Cleveland, Ohio; H. C. Mulroy, Marland Refining Company, Ponca City, Oklahoma; J. P. Duffy, Constantin Refining Company, Tulsa, Oklahoma; K. C. Parkhurst, Kansas Gas and Petroleum Company, Wichita, Kansas; C. E. Varner, Kanotex Refining Company, Arkansas City, Kansas; E. B. Sinclair, Bolene Refining Company, Enid, Oklahoma; E. R. Smith, Oil State Refining Company, Enid, Oklahoma; R. E. Stewart, Barnsdall Refining Company, Tulsa, Oklahoma; W. S. Lynch, Miller Petroleum Company, Kansas City, Missouri; C. F. Dowd, Tidal Refining Company, Tulsa, Oklahoma; H. G. Watts, Derby Oil Company, Wichita, Kansas; J. F. Lawrence, Western Petroleum Refiners Association, Kansas City, Missouri; H. L. McReynolds, White Eagle Oil and Refining Company, Kansas City, Missouri; F. E. Burke, Chestnut and Smith Corporation, Tulsa, Oklahoma; G. L. Walker, Mutual Oil Company, Kansas City, Missouri; C. W. Rice, Vickers Petroleum Company, Wichita, Kansas; G. P. Nissen, Sterling Oil and Refining Company, Wichita, Kansas; A. C. Holmes, Empire Refineries, Tulsa, Oklahoma.

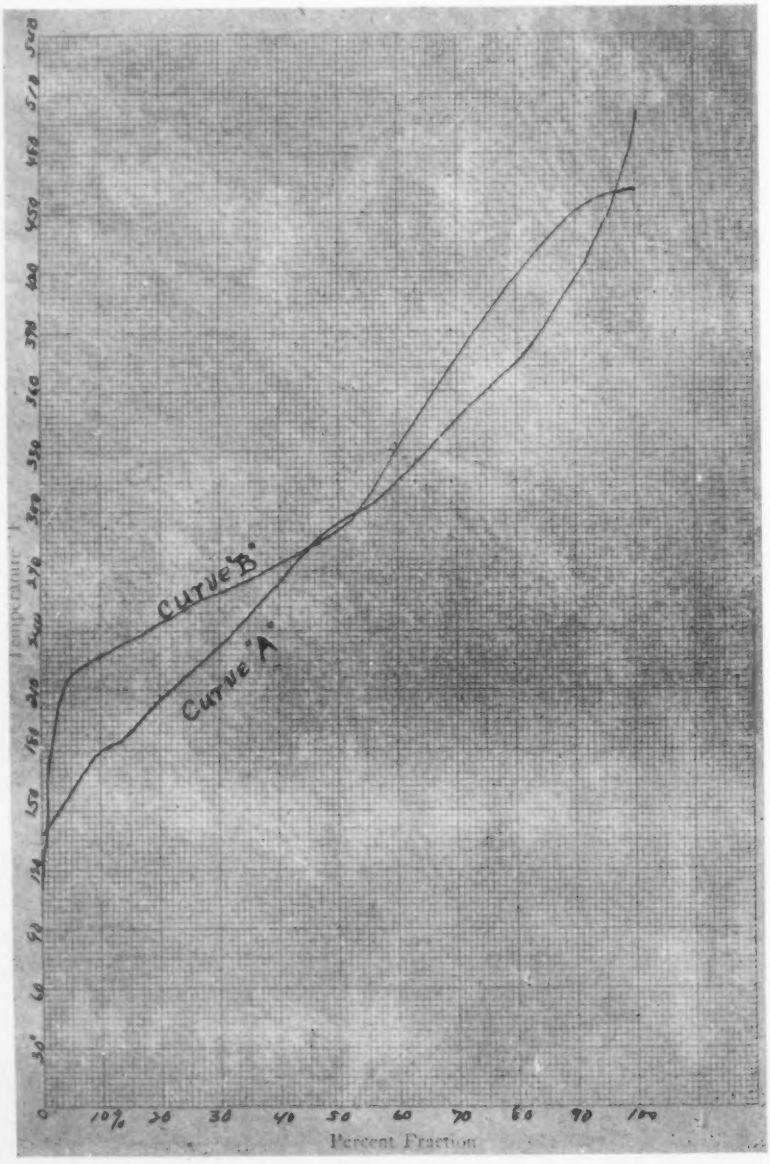

Fig. 4

Refined Products Increase 300 Per Cent

Value now as compared with pre-war years is shown by figures released by Census Bureau

Washington, D. C.—An increase of more than 300% in the value of refined petroleum products now produced as compared with pre-war years is shown by figures just made public by the Census Bureau, which reports the 1921 production to be valued at $1,727,440,200, an increase of 5.8% over 1919, when production totaled $1,632,532,800, and 335.8 per cent over 1914, when production totaled $396,631,400. This was one of the few industries, the figures indicate, which showed a greater production in 1921 than in 1919, which was the peak year in most businesses.

The number of establishments engaged in refining petroleum has steadily increased, from 176 in 1914 to 320 in 1919, and 366 in 1921. Of those reported for 1921, 67 were located in Oklahoma; 64 in Texas; 53 in Pennsylvania; 45 in California, 23 in Kansas; 16 in Louisiana, 13 each in Illinois, Ohio and Wyoming; 9 in New Jersey; 6 each in Kentucky and New York; 5 each in Indiana, Missouri and West Virginia; 4 each in Colorado and Maryland; 3 each in Arkansas and Massachusetts; 2 in Rhode Island; and one each in Delaware, Georgia, Minnesota, Montana, South Carolina, Utah and Virginia.

The increase in the value of products has been accompanied by increases in the number of persons employed, in the total amount paid for salaries and wages, and in the cost of materials used in the industry. The total number of persons engaged in the industry in 1921 was 74,291, of whom 55 were proprietors and firm members, 11,039 salaried employes, and 63,197 the average number of wage earners. In 1919, of a total of 73,473, 59 were proprietors and firm members, 14,525 were salaried employees, and 58,889 were the average number of wage earners. In 1914 the total employed was 31,077, of whom 52 were proprietors and firm members, 5,659 were salaried employees, and the average number of wage earners was 25,366.

Salaries and wages paid in 1921 reached the total of $129,262,700, of which $27,940,300 was salaries and $101,322,400 was wages. In 1919 the total payment on this account was $116,368,700, of which $26,619,000 was salaries, and $89,749,700 was wages, while in 1914, $7,892,000 was paid in salaries, and $19,397,000 in wages, a total of $27,289,000. In addition, there was paid for contract work in 1921 $4,832,000, as compared with $2,352,000 in 1919, and $502,700 in 1914.

The cost of materials used in the industry was $1,382,425,000 in 1921, against $1,247,908,400 in 1919, and $325,264,500 in 1914, and the value added by manufacture (the value of products less cost of materials) was $345,014,800 in 1921 against $384,624,400 in 1919, and $71,096,900 in 1914.

The bureau's report shows detailed statistics of production for the years 1921, 1919 and 1914 for various products, which shows that production in the group "naphthas and lighter products" increased 27.8% in quantity and 15.1% in value since 1919, and the output in gasoline alone was 39.7% in quantity and 23.7% in value greater than in the preceding census year.

The detailed statistics of production for the various groups of refined products are shown in the table below.

	Value	Gallons	Av. per Gallon
1921 PRODUCTION:			
Naphthas and lighter products—			
Gasoline	$ 840,672,300	5,098,056,700	$0.164
Naphtha, benzine, etc.	40,729,400	275,176,200	.148
Illuminating oils	152,515,900	1,963,826,600	.078
Fuel oils—			
Distillates	59,586,100	1,220,247,000	.049
Gas oils	85,327,400	1,634,340,200	.052
Residual fuel oil	232,355,700	6,894,534,300	.033
Lubricating oils	194,609,300	949,246,700	...
Greases	9,754,800	24,440,000	...
Liquid asphaltic road oils	7,831,200	168,378,000	.046
All other products	104,063,100	.....	...
Total value of products, 1921	$1,727,440,200	.....	...
1919 PRODUCTION:	Value	Gallons	Av. per Gallon
Naphthas and lighter products—			
Gasoline	$ 679,867,100	3,648,590,600	$0.186
Naphtha, benzine, etc.	86,139,000	557,036,200	.155
Illuminating oils	235,663,100	2,305,489,700	.102
Fuel oils—			
Distillates	36,548,100	646,652,600	.056
Gas oils	76,383,400	1,393,623,500	.054
Residual fuel oil	205,192,800	5,727,624,500	.035
Lubricating oils	196,242,400	821,580,400	...
Greases	11,896,700	28,147,500	...
Liquid asphaltic road oils	4,491,400	98,036,500	.046
All other products	100,108,800	.....	...
Total value of products, 1919	$1,632,532,800	.....	...
1914 PRODUCTION:	Value	Gallons	Av. per Gallon
Naphthas and lighter products—			
Gasoline	$106,140,200	1,195,412,100	$0.088
Naphtha, benzine, etc.	15,779,100	264,626,100	.06
Illuminating oils	96,806,500	1,935,274,800	.05
Fuel oils—			
Distillates	15,999,400	457,491,600	.035
Gas oils	22,805,300	755,558,400	.03
Residual fuel oil	45,213,200	2,521,042,000	.087
Lubricating oils	55,812,100	517,838,800	...
Greases	3,536,500	14,006,400	...
Liquid asphaltic road oils	†	†	...
All other products, value	34,269,100	.....	...
Total value of products, 1914	$396,361,400	.....	...

†—Figures not available.

TRC Rate of 25 Cents On Natural Gasoline

Dallas, Texas.—The granting of a maximum rate of 25 cents per 100 pounds on casinghead and absorption gasolines, in tank cars, when consigned to refineries for manufacture of refined products, in common point territory, by the Texas Railroad Commission early in March has not been placed into effect because of a rehearing asked for by the railroads. However, an exception was made to Dallas and nearby switching points, and the new rate was placed into effect in March. The old rate for Dallas was 39½ cents per 100 pounds, or a difference of about .099 cents per gallon in freight. The points that the rate is to apply from are: Burkburnett, Breckenridge, Wichita Falls, Electra, Iowa Park, Jakehamon and Frankell, Texas.

Lubrite Organizes Sales Company With Tulsa Firm

St. Louis, Mo.—The Lubrite Refining Company of this place and the Tulsa Oil Products Company of Tulsa, Oklahoma, have combined and organized the Lubrite Sales Corporation to handle the tank car departments of both concerns. General offices of the new concern will be maintained at the Lubrite headquarters in St. Louis.

The Lubrite Sales Corporation will also direct and handle the retail distribution of the gasoline manufactured by the Lubrite plant.

H. T. Ashton, formerly with the sales department of the Pure Oil Company, is sales manager of the Lubrite organizations.

Toledo, Ohio.—The Standard Oil Company (Ohio), has started work on its $2,000,000 expansion program and the company's refinery on the east bay shore just out of Toledo will be doubled in capacity.

White Gets Contract for P. & R. Corp.'s Lube Plant

Denver, Colo.—The J. G. White Engineering Company has been awarded the contract for the construction of that portion of Producers and Refiners Corporation's Parco, Wyoming, refinery comprising the lubricating oil and wax plants.

XUM

Hovey Process Keeps Carbon in Suspension

Agitation by steam from bottom of still keeps carbon from settling and enables removing it

By W. A. Manion

The independent refiner is undoubtedly today greatly interested in cracking as it is to this branch of refining he must look to to increase the production of gasoline and kerosene from crude oil thereby insuring profitable refining operation.

The Standard and other of the larger companies have used the cracking still on a large scale for the last ten or twelve years and mainly due to same were enabled to run at a profit during the recent period of depression.

With the steadily increasing demand for gasoline and kerosene the old skimming method of refining cannot continue for very obvious economic reasons.

A great many articles have been written on the subject of cracking, describing different methods with their respective claims of merit.

The Burton still was the first commercially practical still used which is of the ordinary shell type using false bottoms for collecting carbon or coke deposit. Since then innumerable types have been developed of both shell and tube type.

Cracking can only be accomplished by placing the heavier oils under high heat which is provided through pressure and regardless of shape of container if a given heat is supplied a like degree of cracking must take place and from that point is only question of separating vapors.

When oil is cracked carbon is liberated and it is deposit of this carbon that causes trouble and it is only the method of taking care of this carbon that is vital to any cracking process.

Three Groups

The principals involved in processes so far developed can be classed in three groups:

1. Shell type stills erected either vertical or horizontal using false bottoms mechanical scrapers, sliding chains, etc for keeping carbon off heated parts of still.

2. Shell or tube type stills vertical with or without scrapers depositing carbon out of heated zone.

3. Tube type depending on rapid circulation and deposit of carbon in expansion chamber.

In all of these processes carbon is deposited in form of coke requiring periodical cleaning.

The Hovey cracking process differs from all others in that the carbon is kept in suspension and withdrawn from still continuously through tar line.

The carbon released in cracking, as every refiner knows, is in form of a very fine powder and requires but slight agitation to hold in suspension. This agitation is accomplished by use of a small amount of superheated steam injected through perforated pipes, forming a spray over entire bottom of still, sweeping clean and keeping carbon in suspension.

The thought ordinarily entering a refiner's mind on use of steam is to prevent, rather than aid, cracking which would be true if ordinary saturated steam was used. However, the unequal expansion is taken care of outside the still so that when steam is released into still the steam is at slightly higher temperature than oil in distillation, therefore in no way affecting pressure or temperature.

Two small towers are used, the first tower naturally running at temperature too high to allow condensation of any steam, run back from this tower is open to still. The second tower is equipped with trap for drawing off any water condensate, allowing any part or all of the oil condensate to return to still through run back.

Principles involved in this process have been thoroughly demonstrated through actual operations.

The quality of pressure distillate is of better color and odor than ordinarily produced.

The capacity of this still per day is equal to any other with equal overhead construction for vapor separation. The capacity, however, is increased through continuous operation.

Cost

Operating costs are lowered through saving of fuel required in batch process in heating cold settings, also through continuous operation the cold oil charged absorbs the heat from the hot tar through the use of heat exchangers and from this exchanger passes through a second, picking up waste heat from steam superheater and still.

It is claimed for tube type stills that fuel costs are lower due to increased heating surface of tubes over shell type, however, it is readily seen that with the Hovey cracking still a much greater heating surface is supplied in exchangers where all heat possible is absorbed at much lower temperatures and below temperature where carbon or coke would be formed.

Due to continuous operation a comparatively small still is used together with smaller towers than ordinarily used, which increased the factor of safety, and with the elimination of carbon deposit all danger is reduced to a minimum. In addition, the fact of having steam in the still at all times is another factor of safety. In case of mechanical fracture of any type of still it is always necessary to admit steam to prevent explosion.

I have been engaged in refining oil for the past 28 years and have investigated numerous processes, keeping in close touch with developments along cracking lines and from my experience and knowledge am convinced that the Hovey cracking process has solved the problem of eliminating carbon troubles and at the same time reduced costs to a minimum.

Joint Meet at St. Louis Held Early In Month—Traffic Matters Discussed

St. Louis, Mo.—Mileage settlements and other traffic matters relating to petroleum transportation came in for discussion at joint conference of railway officials and representatives of oil companies held here March 6 and 7 at the Hotel Statler. The conferences, which were attended by refiners from the Mid-Continent and other sections of the country, were called by W. R. Boyd, Jr., of New York, assistant general secretary of the American Petroleum Institute, and H. E. Felton, chairman of the general committee on railroad transportation of the American Petroleum Institute.

The meeting of the car service subcommittee of the general committee on railroad transportation was held on March 6 and such matters as were pending on the docket were taken up and discussed. In the afternoon a joint conference was had with the sub-committee on records for a discussion of mileage settlements, the proposed amendment to the tariff and excess empty mileage on account of federal control. The mechanical sub-committee also met in the afternoon.

The docket for the meeting of the general committee on March 7 comprised the following important matters of interest to the petroleum industry: (1) report of the mechanical sub-committee; (2) proposed revision of Rule 6, Code of Storage Rules; (3) ICC regulations regarding outage and placarding tank cars; (4) abuse (delay) of tank car equipment; (5) application of rule governing equalization of loaded and empty mileage; (6) proposed revision of Rule 11 of freight tariff 7-C relating to mileage accounting period; (7) proposal to investigate the present estimated weights on petroleum and its products; (8) equalization of excess empty mileage on account of federal control; (9) mileage allowance on privately owned tank car equipment; (10) ARA circular (formerly BCL 190) proposed revision of rules governing location of loading racks, etc.; (11) excess empty mileage resulting from ICC Service Order No. 28.

New business was taken up prior to adjournment.

Tom Maher, sales manager of the Chapman Valve Company, was a visitor in the Houston office of the company last week.

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RECENT REFINERY PATENTS ISSUED

BY STAFF REPRESENTATIVE

Washington, D. C.—The following patents of interest to the oil-refining industry have been recently issued by the United States Patent Office:

Converting Hydrocarbon Oils

No. 1,444,128, a patent on an apparatus for converting hydrocarbon oils, issued on February 6 to William F. Muehl, of Kansas City, Mo. This is an apparatus for convertisg hydrocarbon oil of high boiling point into hydrocarbon oil of lower boiling point, comprising a furnace, heating means including vertically disposed oil conducting pipes in said furnace, an elongated, longitudinally disposed, insulated digester located outside the furnace, a connecting pipe leading from the heating means to one end of the digester, the digester being of sufficient capacity and length to dissipate the velocity of the stream of oil from the connecting pipe when it enters the digester and to allow sufficient time for disintegration of the oil so that the lighter ends will pass off from the heavier ends during the passage of the oil through the digester and carbon be deposited, a dephlegmator, means for discharging vapor from a portion of the digester distant from its inlet end into said dephlegmator, a second elongated, insulated horizontal digester of the same capacity and length as the the first and second digesters to permit unvaporized oil to pass from the first digester into the second digester wherein the temperature of the oil remains substantially undiminished, means for feeding fresh oil into the base of the dephlegmator to collect in a pool therein, means for permitting fresh oil and condensates to overflow from said pool into the second digester, a vapor discharge pipe leading from the second digester to the dephlegmator, means for returning unvaporized oil from the second digester to the heating means, means for maintaining super-atmospheric pressure on the oil, and means for accelerating the flow of oil through the heating means.

No. 1,444,129, issued to William F. Muehl, Kansas City, Mo., on February 6, a method of converting hydrocarbon oil of high boiling point into a hydrocarbon of lower boiling point, which consists in subjecting the oil of high boiling point to a heating zone to raise it to a cracking temperature, passing the oil through the heating zone in vertically ascending streams by so positively inducing the rate of flow that the oil is not cracked during its passage through the heating zone, passing the oil thus heated from the heating zone into one end of a horizontal, elongated, insulated digester and overflowing it from the other end whereby the oil collects in a considerable volume to provide a large body of oil in a quiescent state so that it is maintained at a cracking temperature for a prolonged period without further addition of heat, and wherein the velocity of the incoming oil is reduced to permit carbn precipitation, cracking and vaporization of the oil in the digester all the while maintaining the super-atmospheric pressure upon the oil, scraping the carbon from the bottom of the digester to one end thereof, removing the same, all without agitating the oil in the digester, returning the unvaporized overflowing oil from the digester to the heating zone, and leading off the vapors from the digester.

Chemically Converting Hydrocarbons

No. 1,445,040, issued on February 13 to Landon Cabell Read, Los Angeles, California; Clara Genevieve Read, administratrix of said L. Cabell Read, deceased. The patent covers a process of treating petroleum, and is a process of chemically converting hydro-carbons, embodying first subjecting an original body of hydrocarbons to control conditions including a temperature of approximately 2000 degrees Fahrenheit, and a pressure less than atmospheric to cause chemical conversion, and then subjecting substantially the whole of the converted products to an increase in pressure to cause chemical conversion.

The herein described process of chemically converting hydrocarbons, embodying first subjecting an original body of hydrocarbons to control conditions including a relatively high temperature and a pressure substantially not more than atmospheric to cause chemical conversion, then subjecting substantially the whole of the con-

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verted products to a diminution of temperature but still maintaining the temperature above atmospheric and to an increase of pressure while at that diminished high temperature, then to reduction of temperature to approximately atmospheric; and then finally relieving the pressure to atmospheric pressure.

Conversion of Oils

No. 1,445,281, an apparatus for the conversion of oils, issued on February 13 to Joseph H. Adams, assignor to the Texas Company, Houston, Texas, a corporation of Texas. The patent comprises an apparatus of the class described for the conversion and transformation of high boiling hydrocarbons to low boiling hydrocarbons comprising in combination a furnace, a series of substantially horizontal cracking chambers arranged in tiers and connected in series and extending through the walls of said furnace, removable closures for the ends of said chambers, longitudinally removable collecting pans fitting in said chambers at the bottom, perforated steam pipes entering said chambers through the ends and extending longitudinally above said pans, means for supplying super-heated steam to said steam pipes, means for continuously supplying oil under pressure to the lower end of said series of chamber, means for drawing off the products at the upper end of the series and means for separating the converted vapors from the unconverted products so drawn off, a condenser for said converted vapors in free and open communication through said cracking chambers and means for maintaining pressure in said apparatus to and through the condenser.

Producing Fluid Hydrocarbons

No. 1,445,423, issued on February 13 to Titus Ulke, of Washington, D. C. The patent covers a method of producing fluid hydrocarbons from solid carbonaceous material, which consists in subjecting the said carbonaceous material at high temperature and pressure to the hydrogenating action of a compound which leaves a residue of alkali carbonate, condensing the resultant vapors, regenerating the said hydrogen-yielding compound from a portion of the reaction products, and re-using the said compound for reaction with and hydrogenating of a new portion of the said carbonaceous material.

A process of treating peat to secure a high yield of the liquid carbon compounds consisting in the cycle of steps comprising hydrogenizing peat with sodium formate at a pressure of about 100 atmospheres and a temperature of about 400 degrees Centigrade, collecting the products of the reaction and treating them to obtain carbon monoxide gas and solid sodium hydrate 1, and regenerating said sodium formate by combining the said carbon monoxide gas and sodium hydrate by treatment of reaction products of the hydrogenating step and using the regenerated formate to hydrogenate a new charge.

Cracking Apparatus

No. 1,445,433, issued on February 13 to Stephen Louis Gartlan, Toronto, Ontario, Canada, assignor of 55-100ths to Albert Edward Gooderham, Toronto, Ontario, Canada. The patent is a cracking apparatus for the production of lower boiling hydrocarbons comprising means for vaporizing the hydrocarbon mass at about atmospheric pressure, means for continuously withdrawing the vapors from the vaporizing zone during the vaporizing period and compressing all of them under regulable conditions of temperature and pressure, and means for releasing the pressure after compression for the sudden expansion and liquefaction of the vapors to form a resulting product differing in specific gravity and boiling points from the hydrocarbon vaporized.

Apparatus For Refining

No. 1,447,118, a process and apparatus for refining petroleum oil, issued on February 27 to John C. Black, Destrehan, La., assignor of one-half to James W. Weir, Fillmore, California. The patent consists of the process of fractionally separating mixed oil vapors obtained by distillation of oil comprising continuously circulating from a source of supply to a mixing compartment a liquid hydrocarbon of approximately the same composition as the oil fraction which it is desired to separate out and bringing it into intimate contact with the mixed oil vapors to liquify and separate from the residual vapors the fraction having substantially the same composition as the circulated hydrocarbon.

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In the Chicago Switching District

Refiners, jobbers and marketers desirous of distributing in and about Chicago will be especially interested in the exceptional storage facilities just completed at Clearing, Ill., in the Chicago switching district.

Tanks having a capacity of 39,000 barrels have been acquired by North American, and are now ready to receive liquid petroleum products under the usual North American Oil Terminal Warehouse conditions.

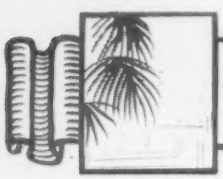
Write, phone or wire for details

NORTH AMERICAN CAR CO.

327 S. LaSalle St. CHICAGO, ILL

COFFEYVILLE, KAN.

1003 Daniel Bldg., TULSA, OKLA.



NOT SO REFINED

An inquisitive subscriber from El Dorado, Arkansas, wants to know what kind of cracking process the Chicago bandits have been using on Standard Oil filling station safes in the Windy City.

The Jitney Unit

Miss Ima Comeon of Bayonne writes in to suggest that the "Jitney Unit" gasoline plant described in a former issue of The Refiner, certainly ought to go well in some cities.

"I have just come from Tulsa and there are enough jitneys in Tulsa alone to make such a plant very popular," she says. "On the other hand, there are a lot of towns I've been in lately that are passing laws against the jitneys, and a gasoline man ought to take that into consideration," she concludes.

It Doesn't Matter

A pump manufacturer complains that a story we once carried about a refinery in Kentucky which didn't have any pumps, doesn't do the pump makers any good. That's all right, brother. We haven't noticed the Kentucky plant being summoned to Washington to answer to a charge of participating in price fixing, so maybe it hasn't been as unqualified success from a financial standpoint as the one at Whiting.

New Demand

Refineries with a big supply of kerosene on hand will be interested in knowing that the kerosene problem has been solved, and that there will be a strong demand for that product in the future. As told in a brother publication of The Refiner, the story runs like this:

"A speaker at the fall convention of the National Petroleum Marketers Association, Mr. Reed of Atlanta, spoke of the desirability of kerosene getting back on an equal basis with gasoline in consumption demand and price.

"Louis Rothermel of the Deepwater Oil Refineries, while not a factor in the light oil trade, points out the way.

"Mr. Rothermel has discovered through contact with some lady cat fanciers who were soliciting advertising for a cat magazine, that the oil industry should advertise to that trade as cat fanciers are prolific users of kerosene.

"This is the inside dope:

"'Every cat fancier knows that nothing is better for the health of cats than one teaspoonful of kerosene once a month.'

"What an outlet the industry has been overlooking!

"Now all the ad writers should get busy and advertise 'Kerosene for Cats'. What company will be the first to put out a special trade-marked brand for this trade?

"The possibilities are enormous.

"Our statistical department has figured it out for us. To dispose of only one tank car of kerosene in this manner it would be necessary to doctor only 10,240,000 cats. If you don't believe there are a lot of cats, just listen some evening.

"And speaking of 10,240,000 cats, our statistician has figured further, as statisticians always should, that if these cats were placed end to end in a row, they would reach from San Francisco to New York and back to Chicago, this only allowing them room to wag their tails."—The Filling Station.

We Must Be Careful

One of our friends with the Brown Instrument Company suggested last fall that we doll The Refiner up and put a little more human pep into it. This we have tried to do, but we cannot help remember what happened to a Pennsylvania refiner's Ford when he tried to pep it up.

He grafted a monkey wrench gland into it and cranked 'er up. The car started wildly down the street jumping from side to side. A traffic policeman tried to stop it and the car bit him on his arm, ran up a telegraph pole and hung by its tail light.

You can't be too careful these days in pepping things up. Remember what Colonel Dunn is trying to do to keep oil men from putting pep into naphtha by injecting a little natural gasoline stuff into it. The Colonel, if let alone, we are afraid, will have it to the point where a motorist will have to buy his gasoline pep from a bootlegger and pep up his carburetor from a pocket flask wrapped in asbestos with a 1200-pound safety valve on it, and deliver it with a two-inch dropper made of forged steel.

Oklahoma Commission Has Issued New Set of Rules

Oklahoma City, Okla. — The Oklahoma corporation commission has just issued a supplemental set of rules regulating the handling of gasoline, kerosene, naphtha and other inflammable liquids. The additional rules which are supplemental to an order issued more than a year ago, are as follows:

Complete separate pipe lines shall be installed for the unloading of gasoline, naphtha or kerosene by suction and discharge lines above the ground shall be painted red for gasoline and green or blue for other liquids.

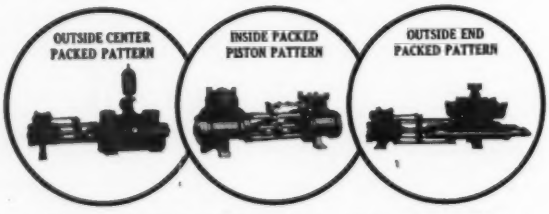
All new electrical installations and appliances must conform to the code of the national board of fire underwriters.

Warehouses and storage stations must be equipped with fire extinguishers and sand supplies.

Tank wagons must be grounded for electricity from the ends of the discharge pipes, by means of chains or some other conveyor of electricity.

Electrically Driven Centrifuges
Hand Centrifuges
WRITE
WILLIAMS, BROWN & EARLE, Inc.
Manufacturers of Laboratory Apparatus
918 Chestnut St. Philadelphia, Pa.

DURABLE DUPLEX STEAM PUMPS



NEW YORK SALES OFFICE, 141 BROADWAY
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PERSONNEL OF THE INDUSTRY

A. V. Bourque of Tulsa, secretary of the Association of Natural Gasoline Manufacturers, and A. C. Holmes of Tulsa, traffic manager of the Empire Refineries, were among those attending the meeting of the general committee on railroad transportation of the American Petroleum Institute at St. Louis in March.

A. E. Landsittel, sales manager of the Producers and Refiners Corporation, has resigned to accept the position of sales manager for the Globe Oil and Refining Company of Blackwell, Okla. which has opened offices at 303-304 Atlas Life Building, Tulsa.

Producers and Refiners Corporation announce the promotion of R. W. McDowell of the Tulsa office to become assistant general sales manager in charge of Mid-Continent sales of the company. Mr. McDowell succeeds A. E. Landsittel and has been connected with the P. & R. sales department for the last four years.

Ray Williams, formerly connected with the Midwest Refining Company, with offices at Casper, Wyoming, has accepted a position with the Louisiana Oil Refining Corporation at Shreveport.

A. P. Morrison of the Kanotex Refining Company, Arkansas City, Kansas, was a business visitor to Kansas City during the past month.

A. C. Anderson, who has charge of the construction of the absorption plant of the Producers and Refiners Corporation at Casper, is now with the Hope Engineering and Supply Company at Breckenridge, Texas.

R. L. Waldi, formerly superintendent of the Southern Oil Corporation's plant at Walters, Oklahoma, has accepted a position with the Skelly Oil Company and is now in charge of the company's refining and pipe line interest in the Burkburnett district.

L. L. Marcell, president of the White Eagle Oil & Refining Company, with headquarters at Kansas City, is spending a few weeks on the Pacific Coast.

Walter Willard, field secretary for the Western Petroleum Refiners Association slipped on the ice in Chicago early in the month and suffered a broken leg. He is at Mercy Hospital in Chicago where reports say that he is getting along very nicely.

G. N. MOORE
President of the Western Petroleum Refiners Association and one of the larger independent Mid-Continent Refiners.

E. W. Marland of the Marland organization and J. J. McGraw of Tulsa have left for an extended yacht cruise through southern waters.

Herbert G. Naylor has recently been elected a vice president of the Midwest Refining Company. Mr. Naylor is one of the best known oil men in the west. He will maintain headquarters at Casper.

William Brown McComb, head of the McComb Process Company with headquarters at New York City, visited the refining centers in North Texas and along the Gulf Coast recently to renew old acquaintances and to look the refining situation over. The McComb Process Company's method of cracking oils is being used by plants located at Buffalo, New York, and at Havana, Cuba.

L. A. Parsons, representative of the Merrial Valve Company of New York, was in Houston during the month, where he is establishing a branch office for his firm at 615 Washington Avenue.

Fred W. Ranger of the natural gasoline manufacturing department of the Phillips Petroleum Company of Bartlesville, Oklahoma, spent considerable time in North Texas early this month securing gas contracts for the company's three new absorption plants under construction in the Young County, Texas oil fields.

F. T. Cuthbert, formerly vice president, has succeeded J. G. Neubauer as president of the Solar Refining Company, the latter having retired from the directorate and the presidency. F. G. Borges is vice president of the company and N. D. Keys, secretary and treasurer. H. O. Bently has been elected a director of Solar Refining.

The C. & G. Cooper Company of Mt. Vernon, Ohio, has opened a Tulsa branch at 504 Kennedy building with T. F. Hudgins in charge. Mr. Hudgins formerly was with the National Supply Company and is well known in oil circles. The C. & G. Cooper Company is one of the largest manufacturers of gas engines and compressors in the country.

Celite Products Company, manufacturers of Celite Products, including Silocel insulation products, and Filtercel, have opened an office in the West building, Houston, in charge of F. M. Strout.

Paul Gerhard, representative for the W. M. Kellogg Company of New York has arrived in Tulsa to open a Mid-Continent office for his company. Offices have been secured at 307 Kennedy building where Mr. Gerhard will be at home to those interested in the Fleming cracking process, which the company is offering to the trade.

D. A. Windsor, formerly with the Pure Oil Company, has become associated with the Lubrite Refining Company at St. Louis in charge of the light oil department.

H. H. Rathvon has been engaged as construction and operating engineer for the Sunburst Refining Company in the erection of the company's new plant at Great Falls, Mont. Mr. Rathvon was previously with the Mutual Oil Company at Glenrock.

Carl Jolliffe, manager of the Sproul Gasoline Plant at Peru, Kansas, has resigned his position to become connected with the White Eagle Oil and Refining Company as director of the advertising department.

H. C. Cummins, president of the Shaffer Oil and Refining Company, completed an inspection tour of the company's properties in the Mid-Continent during the month and has returned to his Chicago headquarters.

Mietz Diesel Type Engine Bought By Charter Concern

New York, N. Y.—The Charter Gas Engine Company of Sterling, Ill., U. S. A., announces the purchase of the entire "Mietz" oil engine (also known as "Mietz and Weiss") business, heretofore carried on at 128-138 Mott Street, and 430 East 19th Street, New York City by the August Mietz Corporation. This effects a merger and consolidation, under one management, of two of the oldest and best known internal combustion engines in the world.

The "Mietz" oil engine was the pioneer semi-Diesel oil engine of the world. The first "Mietz" oil engine was built in 1895 by Mietz and Weiss, and since that time there has been placed in service some 375,000 H. P. in all parts of the world. The "Charter" engine was the pioneer gasoline engine of the world, the first one having been built in 1886 and so far as is known it was the first commercially successful engine to use liquid fuel in the world.

The Charter Gas Engine Company is now moving from New York City to their plant at Sterling, Illinois, all of the physical assets comprising the "Mietz" engine and in the meantime is filling repair orders from New York City, so that there will be no interruption in repair service to "Mietz" engine users.

Chicago, Ill. It is announced that recent re-financing of Producers and Refiners Corporation has been successfully completed. One hundred and fifty new shares of common stock at $50 per share were offered to the stock holders at par and have been taken in full.

Our New Size

DUE to complaint on the part of advertisers that the small size of the old Refiner and Natural Gasoline Manufacturer was costing them a considerable amount of money because of engraving costs, etc., the publishers of this journal changed its size to what is known as "standard size" in February.

Apparently the change in size has met with general approval. Although previous issues had carried articles of just as great value as those in the February issue, the demand for the February issue was such that the available supply was completely exhausted long before orders for copies in quantity stopped.

Thanks to the courtesy of a great number of our readers who in reply to letters from us, gave us names of refinery and natural gasoline men whom they thought would be interested in reading The Refiner and Natural Gasoline Manufacturer, sample copies of the February issue went to more than a thousand people who had never heard of it.

To date The Refiner and Natural Gasoline Manufacturer, now in its eighth month, has received enough paid subscriptions to put it well in the lead of the refinery and natural gasoline circulation of any other journal—and at the rate subscriptions are coming in, this journal will have a lead of around 50 per cent by the time its semi-annual circulation audit is made in July. This has been largely due to the welcome The Refiner and Natural Gasoline Manufacturer has had at the hands of its readers, and the "word of mouth" advertising that they have done for it, coupled with several thousand sample copies which we have been mailing all over the United States.

As the number of paid subscribers grows, naturally the number of sample copies is cut down—

Which means—if you want The Refiner and Natural Gasoline Manufacturer every month, send in your dollar.

Chicago, Ill.—The Calorizing Company of Pittsburgh, Pennsylvania, announces the opening of several new branch offices. At Chicago a new office has been put in charge of W. C. Shaefer and a new office has been established at Houston with Major Risdon as representative.

Orient Company Re-elects Old Officers for 1923

Kansas City, Mo.—At the annual meeting of the Orient Petroleum Company held here during the last of February, all retiring officers were re-elected for the coming year.

Old officers are: President, H. C. Meier; vice president and general manager, W. F. Davis; secretary, H. G. James; treasurer, J. P. Howe.

The Orient's refinery at Wichita Falls, Texas, is running 1300 barrels a day and is reported to be getting a large gasoline yield from its North Texas crude.

READ THIS LETTER

Graham, Texas.

The Refiner and Natural Gasoline Manufacturer,
Houston, Texas.

Gentlemen:

On page 17 of your January issue we note with a goodly degree of interest the "jitney unit" gasoline plant and will be glad to have you advise us name of the manufacturer.

I might add at this time that you are surely making an excellent oil journal out of "The Refiner". Each issue is found to be chuck full of good and interesting articles.

Thanking you and extending our best wishes for your continued success, we are

Yours very truly,
J. G. KILGORE, President,
Graham Refining Company.

Southwestern Refinery Apparatus Saves the Gasoline

Gasoline Condensers **Heat Exchangers**
Coolers **Dephlegmators**

Send for Bulletin D-6

SOUTHWESTERN CONDENSER COMPANY, Inc.

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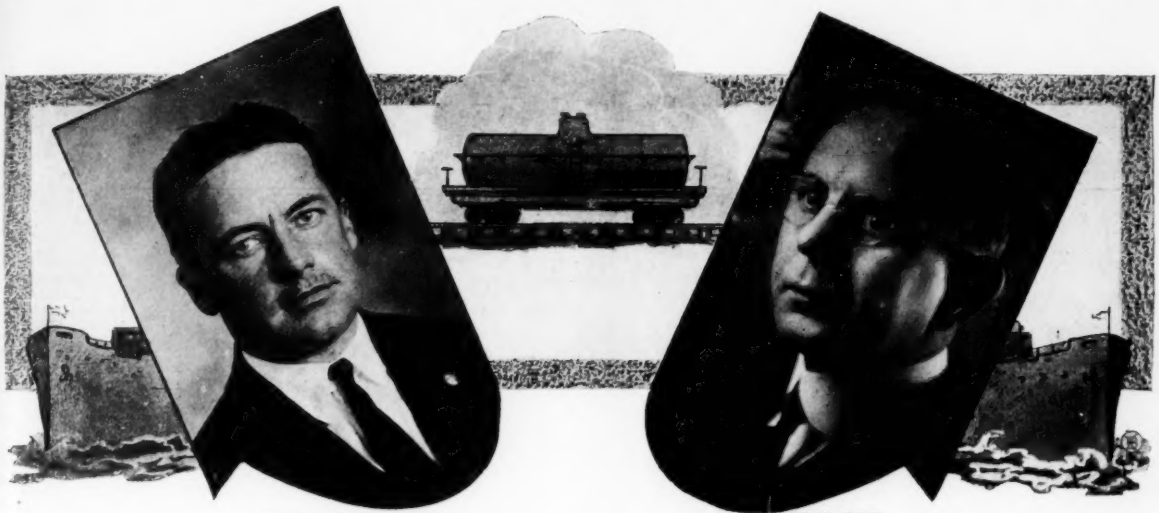

H. A. HASSAN, JR. S. R. SCIVALLY

BETWEEN them, S. B. Scivally and H. A. Hassan, Jr., hold the petroleum buying championship of the world.

For the information of the few who may not know the two men, it may be said that Scivally is manager of the Union Petroleum Company office in Tulsa, Okla., while Hassan holds a similar position for the same company at Dallas, Texas.

In proof of the championship contentions previously stated, here are the facts. The Union Petroleum Company exported 85% to 90% of the light oil that left Gulf ports of the United States from independent Mid-Continent plants in 1922.

Scivally and Hassan bought the bulk of the Union's requirements for the year. Their orders for the year reached 25,000 cars of gasoline and kerosene, 16,500 gasoline and 8500 kerosene. These made up 135 cargoes, which left the Union terminal at Weswego, La. In addition to the gasoline and kerosene, the two men bought more lubricating oils and waxes for export than all other independent exporters.

Aside from their buying for export, these men placed orders for much of the gasoline, kerosene, fuel oil, gas oil and lubricants for domestic distribution through the Philadelphia, Chicago and San Francisco offices of the Union Company.

Total buying by the two men in 1922 was in excess of 30,000 cars of refined petroleum products, most of it for export. Without their orders, the independent refining industry of the Mid-Continent section would doubtless have sagged to extremely low levels.

While the figures given as proof of the buying power of the two Union men are for the year 1922, they are still on the job and it is not unlikely that requirements for 1923 will cause the two to hang up a higher record for this year.

Mr. Scivally has been with the Union since May, 1919, when he left the Sapulpa Refining Company. He has been in charge of the Tulsa office since January 1, 1920. He knows market conditions in the Mid-Continent territory like a coon dog knows the trails of the woods.

Hassan's service with the Union dates back to 1913, when he started as a salesman in the mineral lard oil retail department in Philadelphia, his home town. When Uncle Sam had need for some work in France, Hassan was among the first to answer present. He spent 37 months overseas, received a Croix de Guerre for something of which he refuses to talk and was discharged a captain of artillery.

He returned to the Union Company when discharged and early in 1920 was sent to Dallas, where he opened a buying office for his company.

Oklahoma Bill Proposing Two Cent Tax At Refinery Is Declared Impractical

Tulsa, Okla.—That the proposed two-cent tax on gasoline to be collected at the refinery is too high and impractical was the concensus of opinion expressed at a meeting of refinery representatives held here March 12. The two-cent tax measure is known as House Bill No. 503 and has been proposed by the highway committee of the Oklahoma legislature.

A committee, composed of the following, was named to go to Oklahoma City and confer with members of the highway committee in the legislature: J. R. Trisler of the Imperial Refining Company, D. L. Gilland of Oklahoma Producing and Refining Corporation, E. L. Robinson of the Allied Refining Company, O. L. Cordell of Waite Phillips Company and A. V. Bourque, secretary of the Association of Natural Gasoline Manufacturers.

Refinery representatives who attended the meeting here March 12 besides those mentioned above included W. M. Welch of the Tidal Refining Company, J. V. McCormick of the Allied Refining Company, J. Percy of the Inland Refining Company and C. R. Burke of the Oklahoma Natural Gas Company.

Amity Moves Old Plant To New Bristow Field

Bartlesville, Okla.—The natural gasoline plant of the Amity Gasoline Company in the northwest quarter of section 21-26-27, Rogers County, Oklahoma, has been dismantled and moved to the Bristow district of Creek County in the southwest quarter of section 9-16-8.

The plant has capacity of 1,000,000 cubic feet of gas daily. Lack of sufficient gas makes it impossible to run to capacity at present.

Houston, Texas.—Judge J. C. Hutcheson, Jr., in Federal court here, has rendered judgment for $1,789,000 in favor of James A. Baker, formerly receiver and as receiver for the International and Great Northern railroad against the Pierce Oil Corporation. The suit grew out of the alleged failure of the oil company to supply the railroad with oil at a price specified in a contract.

A CORRECTION

It was stated in the February issue of The Refiner and Natural Gasoline Manufacturer that the Midwest Refining Company had placed orders with the C. & G. Cooper Company of Mt. Vernon, Ohio, for three gas engines, the engines to be direct connected with 15 by 22 inch gas compressors of the Bessemer type.

This was in error, as it should have been stated that the engines will be connected with 15 by 36 and 32 by 36 inch stroke gas compressors of the Cooper type.

A Few Remarks on the Summer Situation

GETTING expressions out of refinery executives as to what the coming summer will bring to the independent refiner was about as easy as pulling teeth, staff representatives of The Refiner and Natural Gasoline Manufacturer found during the past week.

Some refiners who would be considered as "in a position to say" were extremely reticent about saying, and those who would say, weren't at all anxious that their names be used.

"No, Sir. No statement right now," said one Tulsa refiner. "Last week it looked bright. This week it's dark. What I might say right now might make an ass of me next week. You'll have to wait a while."

All of which means that when the Western Petroleum Refiners gather at Galveston shortly they will have a lot to talk about, and a lot of problems to discuss and if possible, solve.

Some pretty good ideas were suggested in the conversations our staff men had with refiners—particularly the idea of one North Texas refiner about how important it is to know refining costs.

Here is the way it has been lined up:

In Oklahoma-Kansas

The Mid-Continent refining situation today does not present an exceptionally bright outlook, due almost wholly to the fact that more refined oils are being turned out than the market is absorbing. Such a condition likely will continue to exist until there has been a drastic reduction in crude runs, or until open weather prevails throughout the upper Southwest and Middle West, which may not be until some time in April or towards the first of May.

A survey of refinery operations in the Mid-Continent as of March 1 disclosed a situation the aspects of which are exceedingly complex. More crude was being run to stills on March 1 than at any time since late last summer, although the condition of the open market has not shown any considerable improvement as gauged by the demand. Since January 1 there has been an increase in refinery crude takings of approximately 28,000 barrels daily and since the low point on December 1, last, an increase of more than 44,000 barrels daily. Much of this crude has been manufactured into finished oils that have gone to storage and are still in storage.

Daily Crude Runs

Daily crude oil runs on March 1 were in the neighborhood of 334,500 barrels as compared to a total of 299,000 barrels on October 1, last, and 290,300 barrels as of December 1, 1922. Independent plants in the Mid-Continent were taking approximately 306,700 barrels at the first of the year. In excess of 87 per cent of this crude was light oil of good gasoline content, much of which was bought at a premium over and above the posted price.

Kansas plants on March 1 were running approximately 60,100 barrels daily, which does not take into account the crude requirements of the Standard Oil Company of Kansas at Neodesha. Twenty-seven plants were operating in Kansas on March 1 out of a total of 41. In Oklahoma 58 plants were taking some 170,000 barrels and 62 refineries in the state were shut down. North Texas refiners were operating 35 plants on March 1 and these plants were taking approximately 60,400 barrels of crude oil daily. Thirty-seven refineries in the state were idle at the time. In North Louisiana there were five plants in operation and 11 were idle, the refineries operating taking slightly more than 15,000 barrels daily. Arkansas had 10 refineries in operation on March 1 and seven shut down. Runs to stills at Arkansas plants were approximately 9500 daily.

Deterrent influences on the refined market have been the slow advance of tank wagon schedules in Standard of Indiana territory and the rapid increase in crude prices as well as the periods of inclement weather which have been freqent and widspread throughout virtually all sections of the Northwest and Middle West. Weather conditions still are unsettled and jobbers and wholesale oil dealers in the territory report a sluggish motor demand not only in the rural districts but in the urban communities as well. The larger refining interests, including the Standard Oil companies, have felt the slump just as sharply as have the smaller independents without retail marketing facilities. Conditions have not been favorable to an increased demand generally.

Rush Diminished

As a result of the sag in the refined market the rush for high grade crude has diminished somewhat although not in proportion to the slackened demand. Premiums continue in the light oil pools where competition is formidable and within recent weeks some new contracts have been made for oil of high gasoline content which will net the producer a neat sum over and above what the pipe line companies would be willing to pay for the crude. On the other hand, quite a number of refiners in Oklahoma and a few in Kansas are cutting down on their crude takings and reducing their plants' runs to conform more nearly to existing market conditions. One refiner in Oklahoma who has been running upwards of 13,000 barrels a day now is down to around 6000 barrels and his storage is still accumulating. Others are faced with a like situation.

The advent of the spring motoring season is going to usher in a period of increased demand with better prices as it always has done. The question is just how the refiners will act when this buying gets under way. With much accumulated stocks on hand the seller in his eagerness to move his stuff may be disposed to disregard the prevailing market level and clean out his surplus at a price which is attractive to the buyer although certainly not conducive to a stronger market for all. That the jobber will be quick to sieze on such a situation no one doubts and in the end it will require a good many days of sunshiny weather to enable the demand to catch up with the re-

fined output to the event that a steadily rising market is in prospect.

Refinery operations during April will be followed with close interest by those who are intent on maintaining present price levels so that all may be in a position to take advantage of the spring demand when it does develop throughout the country.

North Texas

Said a North Texas refiner, "tank wagon prices have been very slow to increase along with higher crude prices but this will likely change with increased demands. With a great deal of unfavorable weather coming in February and March it will likely mean that we will have an open spring. Jobbers will then be forced to place a larger number of orders before summer than was the case last year. The export demand is almost as great as this time last year, however, unfavorable conditions in Europe may eliminate considerable buying which will force the domestic markets to absorb a larger quantity of gasoline over the next few months.

"While the independent refiner of Texas faces many serious problems at this time, yet conditions are not as bad as might seem. With sound business principles applied to the refining industry as obtains in other lines of manufacturing, it will, no doubt, be possible for the average plant to show a profit over the next six weeks or eight months.

"It is true the markets have been unfavorable since recent crude advances, but this state of affairs should not prevail longer than when the usual spring demand sets in. Within the next month or six weeks prices should be at a level that will permit operations more nearly on a profitable basis than obtain today.

No Idea of Costs

"The greatest fault of the average independent refiners is that they have no idea of costs. A cost system can be installed with but very little added expense that will enable the management to definitely determine what rates are being realized on operations. Such a system need not be so complicated as to demand a large clerical force. The sales department should be furnished with cost figures so that they may endeavor to get a selling price in line with manufacturing expenses. Where such a condition as this is brought about, refiners' prices would be stabilized and prevent the violent fluctuations that so often occur now. It will also be necessary for the sales department to carefully analyze the situation existing in all markets where they can reasonably expect to sell their output so that runs may be regulated with changing markets and industrial developments.

"In recent years the demand for gasoline has grown to such an enormous figure that it has become necessary for the greatest possible yield to be derived from the crude charged. The fact that so many refiners are installing a cracking process is evidence that every one realizes a greater gasoline yield must be obtaind in order to continue operations. In operating a cracking unit, it will be necessary to keep accurate cost figures as the majority of processes are leased on a royalty basis. When receiving these figures the average refiner will realize more than ever the need for an accurate record of manufacturing costs.

"Since freight rates were increased in 1920, the territory served by Texas refiners has been gradually narrowed down. The recent adjustment of rates, though, is giving some relief which will enable a wider distribution of products.

"Last year crude prices in North Texas were 25 cents higher than Oklahoma plants were required to pay. This difference was eliminated when crude was placed on a gravity basis by the larger purchasing companies. The worst evil obtaining in North Texas crude markets today is that independent refiners persist in bidding against each other on premiums. It should be possible for the independent refiner to establish connections with producers that would eliminate these excessive costs to the refiner and yet permit the producer to derive more money for his crude than the pipe line companies can afford to pay. The prosperity of the refiner will, of course, control the price of crude at the wells."

"The approaching summer gasoline season will find the independent refiners in the North Texas district more favorably situated to meet the demands of the buyers than has been the case in years," says W. E. Campbell, sales manager for the Panhandle Refining Company, "due to the greatly improved methods of operating skimming plants, installation of cracking processes, and re-establishment of transportation facilities almost to a pre-war basis. While the problem of securing a sufficient amount of crude oil of high gravity has been a serious one for the refiners every summer, the outlook for crude is brighter this year than the summer before because of several new pools furnishing 41 gravity oil or better having been opened up recently. The development of extensions to the Burkburnett and Electra fields has boosted the combined output of these two main crude sources to a higher level than existed last spring and early summer, and the bulk of this new production is available for the independent refiners through the payment of premiums.

"Hardly a plant in the North Texas district that has carried on operations during the past year has not shown a gain of five and as high as 10 per cent in gasoline recovery through the installation of modern equipment and changing of old methods of skimming the oil. Cracking units are being erected in greater numbers, and the usual accumulation of kerosene, gas oils and fuel oil during the summer gasoline season is expected to be reduced somewhat through the operation of these cracking processes.

"If the reports of the marked improvement in business conditions throughout the country are true, the consumption of gasoline during the coming summer months is almost sure to reach a new high level. However, the competition for this anticipated business from a North Texas refiner's standpoint will be keen, due to the invasion on a larger scale of the Middle West, North and East sections of the country by Rocky Mountain refiners and increased refining facilities of virtually all the major companies. The possibilities of huge quantities of gasoline refined on the West Coast being shipped via tankers to Atlantic ports has also loomed up lately, but the usual heavy run on gasoline stocks during the summer months in California is expected to avert any danger of Pacific Coast gasoline flooding the Eastern market.

"The usual mid-winter lull in the gasoline market in the North Texas refining centers broke later than usual this year, having set in late in Febru-

A New Name for an Old Friend

WHAT'S in a name, anyway? The refinery construction work we are doing under the name "Pioneer" is just the same high grade as when it bore the name "Tulsa Boiler and Sheet Iron."

For eighteen years, as the "Tulsa Boiler and Sheet Iron Works" we have turned out tanks and refinery steel construction that made good friends for us among the wise buyers of the Mid-Continent. We pioneered in giving these people "close to home" service on the best kind of work.

Now, under the new name, The Pioneer Tank and Boiler Company, we're all set with the men, machinery and money to keep on growing under the Pioneer banner like we did when Tulsa Boiler and Sheet Iron was on our letterhead.

There is no change in our organization.

Get Pioneer quotations on tank and refinery construction work.

PIONEER TANK & BOILER COMPANY
(Formerly Tulsa Boiler and Sheet Iron Works)
Box 1926, TULSA, OKLA.

REFINERY AND GASOLINE PLANT ACTIVITIES

Humphreys Will Build Refinery at Smith's Bluff—Cross Process Used

Houston, Texas.—The Pure Oil Company placed orders March 5 for 26 Cross units to be built in the new gulf refinery of the Humphreys Pure Oil Company and construction has started at Smiths Bluff, Texas.

This installation, which follows the four Cross units the Pure Oil Company has been operating at Heath, Ohio, since June, 1922, will probably be the largest individual cracking battery in the world by capacity and will have a through-put capacity of over 20,000 barrels per day. The cost of the plant complete will be over $3,500,000 and will be finished this year. This large installation draws attention to the strides made by the Cross process since January, 1922, one unit was in operation, now 68 are either operating or constructing, giving an output capacity of about 4,500,000 barrels of gasoline a year in the following refineries. Indian Refining Company, Petroleum Refining Company, Globe Oil and Refining Company, Pure Oil Company, Royal Dutch Shell group, Sapulpa Refining Company, Sun Oil Company, Clayton Oil and Refining Company, Cory Brothers, Ltd., Indiahoma Refining Company, Waite Phillips & Company, Interstate Refineries, Miller Petroleum Company, Hick O. K. Refining Company.

To date the Cross process has cracked nearly 2,000,000 barrels of oil without a single accident to any of its plants and it has been the constant endeavor of Dr. Cross and the Gasoline Products Company to render the process particularly valuable to the small independent refiner in design by giving each unit flexibility—a Cross unit can crack either kerosene, gas oil or fuel oil without change, thus enabling the refiner to take advantage of any market condition—but by adhering to a low license fee.

These points combined with the very low cost of installation, about $45,000 per unit, and the fact that the majority of the licenses have made profits of over $10,000 a month per unit is probably what has caused the widespread building of the process.

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ary, while last winter a period of depression settled on the market late in November and continued until early spring, with no appreciable outlet for motor fuels except to exporters at a far below cost price. The fact that this year started off with an excellent demand from domestic buyers for gasoline, and lasted until a series of snow storms and cold waves gripped the country, indicates that upon the return of warm weather and clear skies a strong gasoline market is almost certain to follow."

Gasoline Men Get Report From ICC on Regulations

Tulsa, Okla.—The Association of Natural Gasoline Manufacturers has received the following information from the Interstate Commerce Commission relative to the regulations which have been under suspension since January 1:

Regarding paragraph 1051, section L2, which reads "all shipping cards and inflammable and dome placards must be removed from the car and railroad agent promptly notified when car is empty." Also paragraph 405, which made the recommended outage table mandatory, it being ordered that paragraph 1050 "L" as ordered by the commission October 3, 1922, operation of which is under suspension, shall be and remain in force on and after March 15, 1923, and shall be observed until further orders of the commission and that the operation of so much of paragraph 405 as relates to outage, effective January 1, 1923, be and is hereby further suspended that regulations in force prior to January 1, 1923, which would be superceded by the new requirements, be and they are hereby continued in force for the period of a further suspension, and that the propriety of the aforesaid proposed regulations for outage in paragraph 405 shall continue under investigation until further order of the commission.

Stephens County to Get Two Absorption Plants

Fort Worth, Texas. — Construction work on two large absorption gasoline manufacturing plants has been started by the Gulf Production Company in Stephens County, Texas, as part of the expension program proposed during the next six months in this particular branch of the oil industry. The Gulf Production Company has been operating casinghead and absorption plants on its oil and gas leases in Wichita and Eastland Counties for several years and only recently made a decision to enter into the field on a larger scale. The company plans to utilize all of its gas that is rich enough in gasoline content to justify being stripped, and a special type of plant has been perfected for leases with a small gas production.

The absorption plant being erected on the A. M. Fincher tract in section 3352 of the T. L. & E. Co. survey, about six miles southwest of Breckenridge, is expected to be in operation about April 15, and will have a daily capacity of 8,000,000 cubic feet of gas. Producing wells on the Fincher lease, and on the company's W. M. Cox tract nearby will furnish the gas for the plant. The plant being erected on the A. Kloh-Rumsey tract in section 19, Southern Pacific railroad survey block 2, in the Eliasville pool, Stephens County, will be able to handle about 12 000,000 cubic feet of gas daily, and will not be completed until about July first.

P. F. Gwynn, vice president and general manager, and J. W. Beasley, refinery superintendent of the Iowa Park Producing and Refining Company of Iowa Park, Texas, were in St. Louis during the past month in connection with the proposed addition of a cracking unit to the company's skimming plant.

New Orleans, La.—Suit has been filed in Federal court here by the Metropolitan Trust Company of New York to foreclose $6,000,000 mortgage on Louisiana properties of the Island Refining Company of Richmond, Va. The suit seeks to enjoin officers, agents and employes of the company from disposing of the mortgaged property.

A view of the Central Gasoline Producing Company's 25,000,000 cubic foot daily capacity absorption gasoline manufacturing plant, located in the Eliasville pool in Stephens County, Texas.

Lubrite Makes Contract For Oklahoma Light Oil

St. Louis, Mo.—Light oil requirements of the Lubrite Refining Company of this city have been filled for the coming year as the result of a contract just concluded with the Pennok Oil Company for Tonkawa, Oklahoma, crude. Lubrite will take 2000 barrels daily beginning April 1 and will pay a 25 cent premium above the Prairie Oil and Gas Company's posted price for 41 gravity oil, but in the event a higher grading is made by the Prairie the Lubrite company is to pay only five per cent of the total posted quotation at the well.

A 10 car loading rack will be built by the Lubrite at Bliss near the field and a pipe line will be laid to connect with the Pennok properties.

Installation of cracking stills at the Lubrite plant at East St. Louis is expected to be completed about June 1.

Capacity of Imperial Plant Being Increased

Ardmore, Okla.—Construction now in progress will increase the capacity of the Imperial Refining plant here from 4000 barrels daily to 5500 barrels. One pipe still and one still of 1200 barrels capacity are being installed.

Three storage tanks, one of 1100 barrels and two of 900 barrels capacity are being added to storage facilities.

The Imperial Company now is taking crude from the Hewitt field, having contracted for 1300 barrels daily. In the past the plant has been run on Healdton crude.

White Eagle Preparing to Install Texas Co. Process

Fort Worth, Texas. — The White Eagle Oil and Refining Company of Kansas City, Missouri, has begun construction work on a distillate and fuel oil cracking unit to be used in conjunction with its 6,000 barrel skimming plant located near Fort Worth, and orders are being placed for considerable steel tankage to be used in storing refined products at the plant. A license agreement for the Holmes-Manley cracking process has been taken from The Texas Company, which owns the patent on the process, and it is planned to have the project ready for operation about June 1. The initial installment will consist of only one unit, with a daily capacity of from 850 to 1000 barrels, but it is understood that other units will be added if favorable results are obtained.

The White Eagle Company's 6000 barrel capacity refinery at Augusta, Kansas, is using the Burton process for cracking the by products of crude, and only recently added another unit.

Bayonne, N. J.—The Vacuum Oil Company has instituted wage adjustments at the company's works here which brings the rate of pay of employes up to the scale paid by other oil companies. Employes had asked for a 12% increase.

J. T. Gasoline Company Increasing Gaso Plant

Fort Worth, Texas.—The 5,000,000 cubic foot daily capacity absorption gasoline manufacturing plant located on the E. C. Ward lease, southeast of Breckenridge, Stephens County, purchased last fall by the J. T. Gasoline Company from the Plateau Oil Company for $32,500 is being increased in capacity to handle approximately 10,000,000 cubic feet of gas daily. The plant is operated by the Hope Engineering and Supply Company of Mt. Vernon, Ohio, with a present output of about 3300 gallons daily. Ross J. Beatty, vice president of the Inland Steel Company of Chicago, is at the head of the J. T. Gasoline Company.

Miller Installing Cross Process at Wichita Falls

Wichita Falls, Texas.—A double unit of the Cross cracking process is being installed by the Miller Petroleum Company of Kansas City, Missouri, in conjunction with its 2500 barrel daily capacity skimming plant located north of Wichita Falls. Construction work has begun, and it is planned to have the unit completed by June.

Wichita Kan.—Test runs have been made at the plant of the Red Bird Refining Company here preparatory to beginning actual operations. The refinery will specialize on lubricating products.

An actual unretouched photo

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Several New Plants Planned for England

Kansas City, Mo.—Refinery construction work in England is progressing rapidly and several new projects are under way by Cory Brothers, English refinery engineers and builders, according to Charles W. Lovelace of Kansas City, who has been engaged in this kind of work in Great Britain.

A. D. Smith, formerly of Arkansas City, Kansas, is the engineer in charge of the construction of a 15,000-barrel plant at the mouth of the Thames river, being completed by Cory Brothers. The refinery will operate on crude oil from Persia, Trinidad and Texas and will be of the skimming type with a cracking process installed.

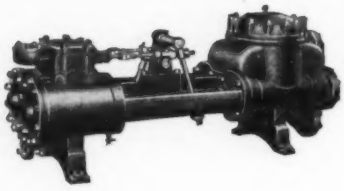
Empire Enters Ibex Pool With New Gasoline Plant

Bartlesville, Okla.—The Empire Gasoline Company has begun construction on a natural gasoline plant in the Ibex field, Shackelford County, Texas. The plant will be of the low pressure type. It will be built on the Brazzell lease in section 52.

In addition to the central plant, a branch plant will be built for handling gas from leases several miles distant. This branch plant will be so constructed that additions can be quickly made in case an increased gas supply is available later.

The plant will be in operation by the latter part of May.

THE BEST DUPLEX MADE



HEAVY SERVICE—19 sizes built for fluid pressures up to 300 pounds.

LIGHT SERVICE—17 sizes built for fluid pressures up to 125 pounds.

UNION STEAM PUMP CO.

BATTLE CREEK, MICH., U. S. A.

UNION PUMPS

New Oklahoma Concern Is Organized for Marketing

Sapulpa, Okla.—The Purity Petroleum Company has been formed here with headquarters in the Clayton building to engage in a general marketing and jobbing business in refined products. Thomas J. Caldwell, who is general manager of the new concern, was associated with the Gulf Refining Company for a number of years and also was with the National Refining Company.

J. C. Ellis Acquires Plant Near Pioneer

Dallas, Texas.—The Brown Petroleum Corporation's one-half interest in the 10,000,000-cubic-foot daily capacity absorption plant located in the pioneer district in Eastland County and operated under the name of the Brown Gasoline Company has been acquired by J. C. Ellis. The plant is to be operated in the future as the Helios Gasoline Company, with headquarters at 610 Kirby building, Dallas. The officers of the Helios Company are: J. C. Ellis, president; P. H. Smith, vice president; M. L. Whitney, secretary and treasurer.

Shaffer Now Testing New Cracking Stills

Cushing, Okla.—Experimental runs at the Shaffer Oil and Refining Company's refinery here have been made testing out new cracking stills recently installed. Installation of more stills is contemplated.

The Shaffer refinery and wax plant here is one of the largest in Oklahoma and is of the most modern type and the installation of the cracking plant will round out the company's refining activities.

Double Unit of Cross Process for Clayton

Dallas, Texas.—Construction work on a double unit of the Cross cracking process is under way at the Clayton Oil and Refining Company's refinery located on the outskirts of this city. The unit is expected to be ready for operation about June 1, and will be used to crack gas oil, kerosene and distillates. It will have a daily charging capacity of about 1000 barrels. The D. H. Christman process of refining crude oil is already in use at the Clayton plant, which has a daily capacity of 4000 barrels of crude.

Fort Smith Plant Is Bought—Will Operate

Fort Smith, Ark.—Oil interests of El Dorado, Ark. have purchased the plant here of the Arkansas Oil Refining Company and will start up the refinery on El Dorado crude oil. The purchasers were represented in the transaction by W. H. Smith of El Dorado.

Panhandle Installing Two Units of Dubbs Process

Wichita Falls, Texas.—Two units of the Dubbs cracking process are being installed by the Panhandle Refining Company in connection with its 4500 barrel daily capacity skimming plant located near this city, and it is planned to have them in operation about July 1. The charging capacity of the two units will amount to about 1000 barrels daily, and they will be used to crack distillates and fuel oil.

Texas Company Has Filed Suit Against MV Railroad

Fort Smith, Ark.—A complaint has been filed in Federal Court here by the Texas Company against the Midland Valley railroad asking judgment for $58,073.81 with interest and cost of action for alleged violation of the act to regulate commerce. The oil company contends that the railroad assessed excessive chargse on rates applied in shipments of natural gas products and naphtha from Tulsa, Oklahoma to Port Arthur, Texas.

Elliott-Jones Installing Unit Of Holmes-Manley Process

San Antonio, Texas.—Elliott Jones & Company, Inc., is erecting a unit of the Holmes-Manley cracking process to be used in conjunction with its 4000 barrels daily capacity skimming plant located near this city. The license for the use of this process, which cracks distillates and fuel oil, is owned and controlled by the Texas Company.

ZEOLITE WATER SOFTENER

The Graver Corporation, East Chicago, Illinois, has issued a booklet on "The Graver Zeolite Water Softener". The new booklet contains complete details on the use and manufacture of the company's famous water softener, "Zeolite."

The operation of the method is well illustrated and the chemistry of Zeolite is carried out completely by the company's publication.

The booklet is for the convenience of the trade and can be secured by writing to the company at East Chicago.

Jenkins Process Is Further Explained

"For every 1000 barrels fresh cracking stock or gas oil stock from skimming plant operation, we run 1500 through the cracking plant. This is accounted for by recycling one third of each pressure operation. Therefore one-third of 1500 equals 500 barrels plus 1000 fresh or 1500 daily cracking charge.

"Now, therefore, 30 per cent new navy gasoline yield on a Jenkins operation is equivalent to 45 per cent by comparison with any other process.

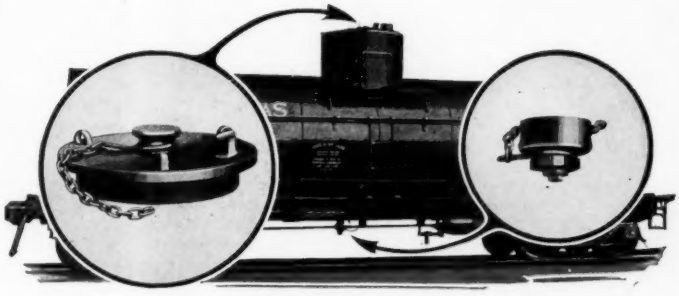
"The operation cost is one cent per barrel charge for each percent of new navy gasoline yield, or $1 per barrel for each barrel of new navy gasoline recovered, charging total cost of operation against gasoline recovered."

Phillips Building Three Gasoline Plants in Texas

Wichita Falls, Texas.—The Phillips Petroleum Company of Bartlesville, Oklahoma has begun construction work on three absorption gasoline manufacturing plants in the Young County, Texas oil fields, and has announced that all three are to be completed within 45 days. Approximately $700,000 is to be expended in erecting these plants, which will have a combined daily capacity of 19,000,000 cubic feet of gas. The construction work is being conducted under the supervision of Dick Best, who maintains headquarters at Graham, Texas.

The largest plant is to be located on the A. B. Hughes tract in the heart of the Herron pool of the Bunger district, and will have a daily capacity of 10,000,000 cubic feet of gas, with 10 units. A 5,000,000 cubic foot daily capacity plant is to be located on the B. F. Scott tract in the South Bend field, and a 4,000,000 cubic foot daily capacity plant is to be erected on the W. B. Owens lease in the Oil City pool of the Bunger district.

Oklahoma City, Okla.—The Peoples Refining Company's plant at Ringling, Oklahoma, has been acquired by the Gilmer Oil Company, producers in the Healdton pool and will be overhauled and conditioned for early operation, according to officials of the company. It is understood that the purchase price also included eight miles of three-inch line from Ringling to the Healdton field.



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We are thoroughly experienced and expert in all work pertaining to the petroleum industry. We turn out large quantities of dome covers, outlet caps, smoke stacks, brake shoes, all kinds of gray iron castings and specialize in refinery construction work.

Western Iron & Foundry Co.

Wichita, Kansas

P. & R. Appeals Case of Coast Refining Process

Chicago, Ill.—It is understood here that Producers and Refiners Corporation will appeal from the decision of District Judge Nelson of Muskogee County, Oklahoma, holding that P. & R. had violated a contract for the use of the Coast Refining process. The court has ordered P. & R. to submit an accounting on May 7 covering the four-and-a-half-year period that the Coast process has been in use at the P. & R. refinery at West Tulsa, Okla., in the manufacture of gasoline.

It is the contention of J. W. Coast, Jr., consulting engineer and inventor of the Coast process, that his process has been used in the recovery of gasoline from low gravity oils and residuum and that rayolties to the full amount had not been paid. The P. & R. Corporation contends that they made changes in the process which increased its value and that they are not liable in the suit.

Absorption Plant Will Be Built Near Eastland

Dallas, Texas.—An absorption gasoline manufacturing plant capable of handling 12,000,000 cubic feet of gas daily is being erected by the Cornite Gasoline and Oil Company on the Texas and Pacific railroad several miles northwest of Eastland in Eastland County at a cost of approximately $40,000. This plant is to be supplied with gas from the commercial gas line owned by the Texas Pipe Line Company and now serving the Eastland district. A contract has been made with the Texas Company to strip the gas of its gasoline contents, and return the residue back into the line. The Cornite Company's headquarters are located at 1602 American Exchange Bank building, Dallas, and the following are officers: T. A. Knight, president; C. F. Corzelius, vice president and general manager; M. A. Knight, secretary and treasurer.

New Kansas Fields Offering Gasoline Plants Inducement

Wichita, Kan.—Construction of natural gasoline plants in Kansas has not been confined to any particular area but the work has been actively pushed in some of the most important pools in the state, especially in Butler and Greenwood counties.

The Lewis Oil Company's absorption plant on the Molter farm in the north end of the Fox-Bush pool has been completed and is in operation. This plant is one of the largest in the state and is of the most modern type with a capacity of 4,500,000 cubic feet of gas.

The plant of the Tidal Refining Company at Magna City in the Fox-Bush pool is operating.

The Empire Gasoline Company has begun construction on a low pressure absorption plant in Greenwood County and will consist of a main plant located near the center of the Seeley pool and branch plants in the Burkett and Wick pools. This company's Seeley and Leon plants, which are of the low pressure absorption type, are about completed and will be in operation shortly.

Grandfield Refinery Has Been Sold by Receivers

Wichita Falls, Texas.—The Union Oil and Refining Company's 2,500-barrel-daily-capacity skimming plant, located at Grandfield, Okla., and only a few miles north of the Burkburnett oil field, was purchased recently at receivership sale by E. A. Sterling Jr. and associates, and arrangements are being perfected to resume operations under the name of Twin Six Oil and Refining Company. Headquarters of the new owners are located at Grandfield. It is reported that the Twin Six Company is negotiating with the Sterling Pipe Line Company for its four-inch pipe line extending from Grandfield south to the Burkburnett field.

May Rebuild Gasoline Plant at Sedan, Kansas

Independence, Kan.—New plans are under way for the re-building of the absorption gasoline plant of Congressman-elect W. H. Sproul of Sedan, Kan. which was destroyed by fire last month at Peru, this state. The plant was of modern type and well equipped. The loss was partially covered by insurance.

STOCKS ON HAND AT THE REFINERIES DECEMBER 31, 1922

1922	East Coast (N.Y., Phila. & Balt.)	Pa., N. Y., East Ohio & W. Va.	W. Ohio, Ind., Ill., Ky. & Tenn.	Oklahoma & Kansas	Texas
Crude run (bbl.)	10,258,818	1,308,212	1,028,685	2,643,040	6,515,585
Oil pur. to be re-run (bbls.)	536,687	34,186	302,237	560	.....
Gasoline (gal.)	186,728,302	20,346,095	103,810,391	160,507,722	118,722,771
Kerosene (gal.)	84,348,338	13,246,435	39,630,027	30,748,052	54,761,518
Gas and fuel (gal.)	259,286,446	25,443,906	26,391,368	110,140,775	310,919,387
Lubricating (gal.)	92,308,579	36,798,878	23,341,159	16,031,098	46,922,619
Wax (lb.)	53,323,688	27,507,924	21,772,494	3,222,478	13,044,728
Coke (ton)	14,157	105	5,452	4,068	8,258
Asphalt (ton)	62,475	2,744	9,958	189	13,665
Miscellaneous (gal.)	192,016,399	40,809,508	74,423,671	69,699,869	217,604,580

1922	Louisiana and Arkansas	Colorado & Wyoming	California	Total stocks end of Dec. 1922	Total stocks end of Dec. 1921
Crude oil (bbl.)	5,036,675	3,880,100	3,133,760	33,804,875	26,562,424
Oils purchased to be re-run (bbl.)	.....	128,978	252,404	1,255,052	989,470
Gasoline (gal.)	91,069,927	103,241,253	99,366,400	883,792,861	586,087,132
Kerosene (gal.)	25,068,714	5,629,281	27,617,967	281,050,332	341,008,555
Gas and fuel (gal.)	208,711,242	36,162,234	327,672,492	1,304,727,850	1,331,265,439
Lubricating (gal.)	2,483,166	3,708,851	14,140,437	235,734,787	216,765,516
Wax (lb.)	82,318,186	260,732	298,140	201,748,370	202,562,894
Coke (ton)	.....	3,682	.....	35,722	74,508
Asphalt (ton)	17,256	.....	13,172	119,459	98,330
Miscellaneous (gal.)	100,017,798	62,331,282	140,558,790	897,461,897	625,969,094

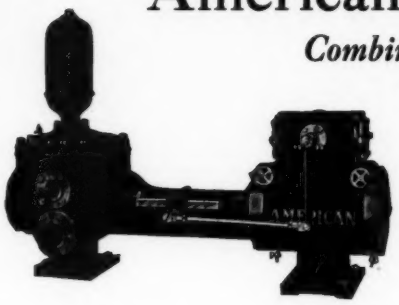
OUTPUT OF REFINERIES IN UNITED STATES FOR DECEMBER, 1922

1922	East Coast (N.Y., Phila. & Balt.)	Pa., N. Y., East Ohio & W. Va.	W. Ohio, Ind., Ill., Ky. & Tenn.	Oklahoma & Kansas	Texas
Crude run (bbl.)	9,015,660	1,768,797	4,055,324	6,978,987	9,386,567
Other oils (bbl.)	825,782	103,503	280,677	433,106	875,776
Gasoline (gal.)	101,121,101	24,521,278	82,340,174	118,645,311	110,568,692
Kerosene (gal.)	56,300,797	12,175,271	16,681,581	31,705,062	61,055,687
Gas and fuel (gal)	184,891,630	17,420,350	54,161,008	125,230,382	204,178,066
Lubricating (gal.)	24,969,864	13,227,816	7,317,294	9,729,610	21,319,536
Wax (lb.)	17,172,307	6,120,731	4,077,264	2,604,615	4,622,425
Coke (ton)	15,510	1,237	16,847	3,671	19,817
Asphalt (ton)	62,582	164	10,937	.....	33,418
Miscellaneous (gal.)	8,505,647	5,363,164	7,136,165	12,427,458	9,283,665
Losses (bbl.)	411,322	108,649	160,391	288,871	306,971

1922	Louisiana and Arkansas	Colorado & Wyoming	California	TOTAL	DAILY AVERAGE 1922	DAILY AVERAGE 1921
Crude run (bbl)	2,335,394	2,116,455	11,051,756	46,708,940	1,506,740	1,265,254
Other oils (bbl.)	179,870	1,241,099	608,641	4,548,454	146,724	115,813
Gasoline (gal)	29,516,246	48,480,075	69,856,800	585,049,677	18,872,570	14,162,303
Kerosene (gal.)	26,226,935	7,745,552	14,347,967	226,238,852	7,298,027	5,494,041
Gas and fuel (gal.)	25,074,971	49,782,212	311,422,850	972,111,469	31,358,435	27,928,035
Lubricating (gal.)	4,582,618	1,391,065	7,246,902	89,784,705	2,896,281	2,663,634
Wax (lb.)	1,701,947	2,922,728	108,105	39,330,122	1,268,714	1,392,229
Coke (ton)	6,759	6,351	.....	70,192	2,264	2,048
Asphalt (ton)	13,793	136	29,758	150,788	4,864	2,8.
Miscellaneous (gal.)	13,669,583	28,063,159	73,715,966	158,164,807	5,102,091	4,195,999
Losses (bbl.)	43,476	77,938	146,749	1,544,377	49,819	54,671

American-Marsh Refinery Pumps

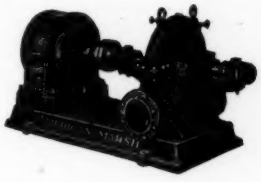
Combine High Efficiency With Great Durability



American-Marsh Pumps meet the demand for strictly high grade high efficiency units where absolute reliability over a long term of years is essential. Their heavy, rugged construction with extra wide passages and large valve areas make them ideal for handling oil and other heavy liquids.

The steam pumps are fully bronze fitted. Heavy cradle yokes are furnished between steam and water ends instead of tie rods, making expensive drip pans unnecessary.

American-Marsh Centrifugal Pumps are made in many different types, some of them especially designed for refinery work. Capacities range from 5 to 5000 gallons per minute and heads up to 250 feet.



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Boiler Feed Pumps	**Air Compressors**
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÷ REFINERY SUPPLIES ÷

Potash Permanganate and Benzol Only Chemicals to Show Material Increase

Chicago, Ill., March 15.—Among chemicals used by refiners only Potash Permanganate and Benzol have seen any important changes in price the past month. The former product is selling at 17 to 19, a gain of about 2 cents. Demand has been very good and supplies were short, many factors being cleaned out of imported altogether and uncertain as to when new orders can be filled from abroad.

Benzol supplies have increased greatly. Sellers have not been anxious to offer in tanks, but have been readily able to meet the demand for smaller quantities. Prices, still high early in February, are now back at the levels that prevailed most of last year.

Caustic Soda and Potash Bichromate show very slight declines in price. Other chemicals are firm at prices that prevailed 30 days ago.

Animal, Fish and Vegetable Oils—Naval Stores

Among animal, fish and vegetable oils and naval stores, interest centers in linseed oil and turpentine, both of which have seen marked advances during the month.

Advances in the market of flaxseed due to scarcity of the product, and low supplies of linseed oil explain its present price of 96 in carlots. Turpentine fluctuated in price early in February, but recovered its strength during the latter part of the month, and is now quoted about 4 points higher than 30 days ago.

Menhaden fish oil continues to strengthen, having gained about 4 points in the month. Supplies of crude are completely cleaned out, while supplies of the refined are low.

A few minor price changes are recorded for other products, but general price levels remain unchanged.

OIL JOBBERS SUPPLIES

Prices based on original packages in large quantities f. o. b. manufacturing point—unless otherwise specified.

Animal, Fish and Vegetable Oils

Lard Oils	Price March 1
Prime, bbls., lb	.15
Extra Winter Strained, bbls., lb.	.14
Extra, bbls., lb.	.13½
Extra No. 1, bbls., lb.	.13¼
No. 1, bbls., lb.	.13
No. 2, bbls., lb.	.12½
Tallow, prime edible, lb.	.09½
Tallow Oil, acidless, bbls., lb.	.12¾
Lard Searine, bbls., lb.	.13¼
Oleo Stearine, bbls., lb.	.10½
Neatsfoot Oil—	
Pure 20 cold test, bbls., lb.	.18½
Pure 30, cold test, bbls., lb.	.16½
Extra, bbls., lb	.13¼
No. 1, bbls., lb.	.13
Horse Oil, bbls., lb.	9
Red Oil, distilled, bbls., lb.	.11½
English Degras, bbls., lb.	4½ .05
Domestic Degras, bbls., lb.	4¾ .05
Menhaden Fish Oil—	
Light Pressed, bbls., gal.	.71 .73
Yellow bleached, bbls., gal.	.74 .75
Herring Oil, tanks, coast, gal.	.42 .50
Whale Oil, bleached, bbls., gal.	.75
Sperm Oil, bleached, bbls., gal.	.99 1.04
Soya Bean Oil, pressed, bbls., lb.	.12½ 12¾
Soya Bean Fatty Acids, tanks, West, lb.	.13¼ 13½
Tallow Fatty Acids, bbls., lb.	.07 .07½
Castor Oil—	
No. 1, bbls., lb.	.13½
No. 3 bbls., lb.	.13
Corn Oil—	
Middle West, tanks, lb	.10¼
Cooperage, l. c. l.	11½
Linseed Oil—	
Carloads, bbls., gal.	.96
Less than 5 bbls., gal.	.91

NAVAL STORES

(Quotations by National Rosin Oil & Size Company, Chicago.)

Rosins—		
B to I, bbls., (280 lbs.)	$6.00	$6.25
10-20 bbl. lots, f. o. b. shipping point	7.20	...
K to WW bbls. (280 lbs.)	6.40	7.95
10-20 bbl. lots, f. o. b. shipping point	7.35	9.35
Turpentine, spirts ex yard gal.		1.55
In drums		1.59
Rosin Oil, first run, gal.		.46
Rosin Oil, second run, gal.		.48
Rosin Pitch, bbl.		6.00
Tar, kiln burned		13.50
Tar, retort		12.50

REFINERS' SUPPLIES

Prices are based on original packages, in large quantities, and represent spot quotations, unless otherwise stated, f. o. b. manufacturing points.

(Quotations by Wishnick-Trumpeer Chem. Co., Chicago.)

Soda Ash, light bags, cwt.	1.75	2.10
Silicate of Soda, 60 deg., tanks cwt.		1.75
Sal Soda, cwt.	1.10	1.30
Caustic Soda, 76% drums, cwt.	3.50	3.75
Chlorate of Soda, kegs, lb.		.07
Nitrate of Soda, cwt.		2.60
Potash Permanganate, lb.	.17	19
Potash Bichromate, sacks, lb.	9¾	10
Sulphuric Acid, 66 deg., tank cars ton	.14	.16
Acetic Acid—		
28%, bbls., lb.	.03¼	.04
56%, bbls., lb	.06¼	.07
80%, bbls., lb.	.09¾	.10¼
Fullers Earth, 16-30 mesh, carloads, ton	$23.00	25.00
Chloride of Lime, cwt.	2.00	2.25
Benzol, pure, water white, gal.	.30	.35
Benzol, 90%, gal.	.27	.33
Toluol, gal.	.30	

Established 1857

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Vilter High Speed Horizontal Refrigerating Machine

Builders of Refrigerating Machinery, Oil Cooling Coils, Gasoline Condensers, Etc.

Vilter Equipment is used in many of the oil refineries.

Vilter-Milwaukee typifies the true standard of reliability in machinery construction and refrigerating engineering.

Vilter Low Temperature Compression System (for efficiently producing low temperatures with compression system.)

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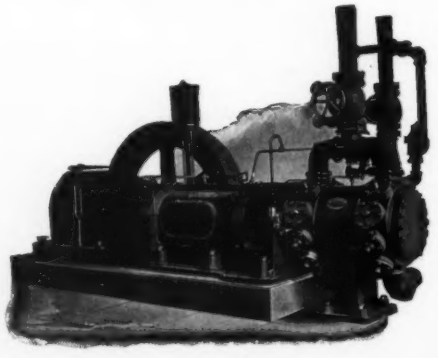

Gypsy's Tonkawa Plant Now Nearing Completion

Tonkawa, Okla.—The natural gasoline plant of the Gypsy Oil Company on the Clark farm in the northwest quarter of section 2-24-1 west, Noble County, is nearing completion. It will use gas from the Tonkawa field.

Bessemer equipment is being installed. Five engines of 165 h. p. each will be installed.

Tulsa, Okla.—The Chestnut & Smith Corporation has material on the ground for erecting a natural gasoline plant near Wymona, Osage County.

REDUCE FIRE HAZARD

STANDARD Seamless Still Tubes

It isn't a new story, the value of highly inspected seamless tubes in pressure stills—but every now and then a disastrous fire results when a high grade of seamless steel tube is NOT used.

STANDARD Seamless still tubes, for use in high pressure stills, are given intensive inspection after each manufacturing operation. Such inspection insures uniformity of quality and provides tubes that the refiner can DEPEND upon.

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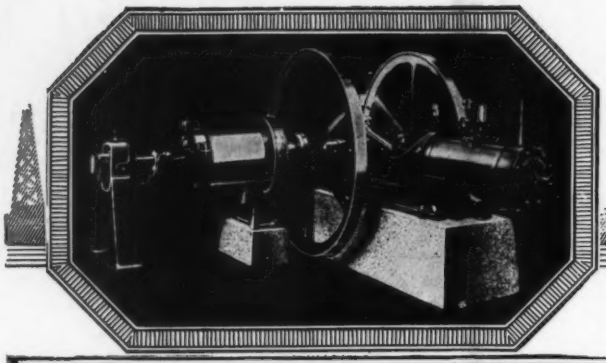

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This is the original two-cycle oil field engine with a cross-head—the engine which has made non-stop runs of two to nine months.

Twenty-Four Years Specialization

Since 1898 The Bessemer Gas Engine Company has been building *and improving* machinery for oil field needs, so that today Bessemer is universally accepted as the standard by which such equipment is judged. Each year has been marked by specific advances in design and in manufacturing skill.

Gas engines, oil engines, compressors, pumps and pumping powers—each are made completely in the Bessemer plant, with the best possible designs, material, and the most painstaking inspections. No item is overlooked to keep Bessemers the best.

Catalogs for any oil field need gladly mailed on request.

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Bessemer Oil Field Engines

Three Styles
5 and 8 H. P.—10 and 12½ H. P.
15 to 35 H. P.

Standard Reverse Clutches.

Type S-G Clutch, newest improved Bessemer equipment.

Commercial Gas Engines; Single and twin cylinder types. Horsepower range 15 to 165.

Roller Pumping Powers; Single and double style.

Gas or Vacuum Pumps; Single and double cylinder types, 14, 16 and 18 inch bore; 12 and 16 inch stroke.

Direct Gas Engine Driven Pumps.

Direct Gas Engine Driven Compressors.

Belted Compressors; Single and two stage.

Combination Oil and Gas Engines 4 sizes—15—20—25—35 H. P.

Oil Engines; Single and twin cylinder; 25 to 180 H. P.

Oil Well Pumping Jacks.

Complete Gasoline Plants.

BESSEMER

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